ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

NOVEMBER 1961

PRICE ONE DOLLAR

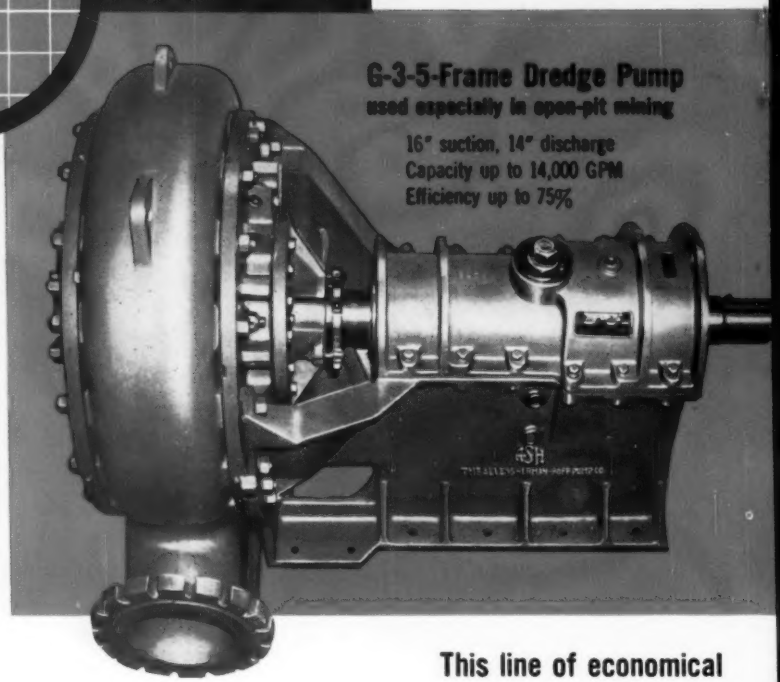
FOUNDED 1866

What Is Happening To Silver?

SPECIAL REPORT p 85

For pumping abrasives over 1/4" diameter

Write for ILLUSTRATED **Brochure No. 657**


G-3-5-Frame Dredge Pump
used especially in open-pit mining
16" suction, 14" discharge
Capacity up to 14,000 GPM
Efficiency up to 75%

HYDROSEAL
SAND & DREDGE TYPE
all-metal pumps

Since solids over ¼" diam. do not bounce off but tend to tear rubber, these pumps have their impellers, shells and suction sleeves made of the alloy most resistant under the wearing conditions. Yet, they have the life-long high efficiency and the power-saving ability that are characteristic of Hydroseal rubber-lined pumps. This is due to the Hydrosealing principle of gland protection by clear liquid under pressure, and to the patented axial adjustment for proper clearance of wearing parts. According to use, replaceable side bell liners may be of rubber or metal. Write us about your pumping problem.

This line of economical pumps also includes—

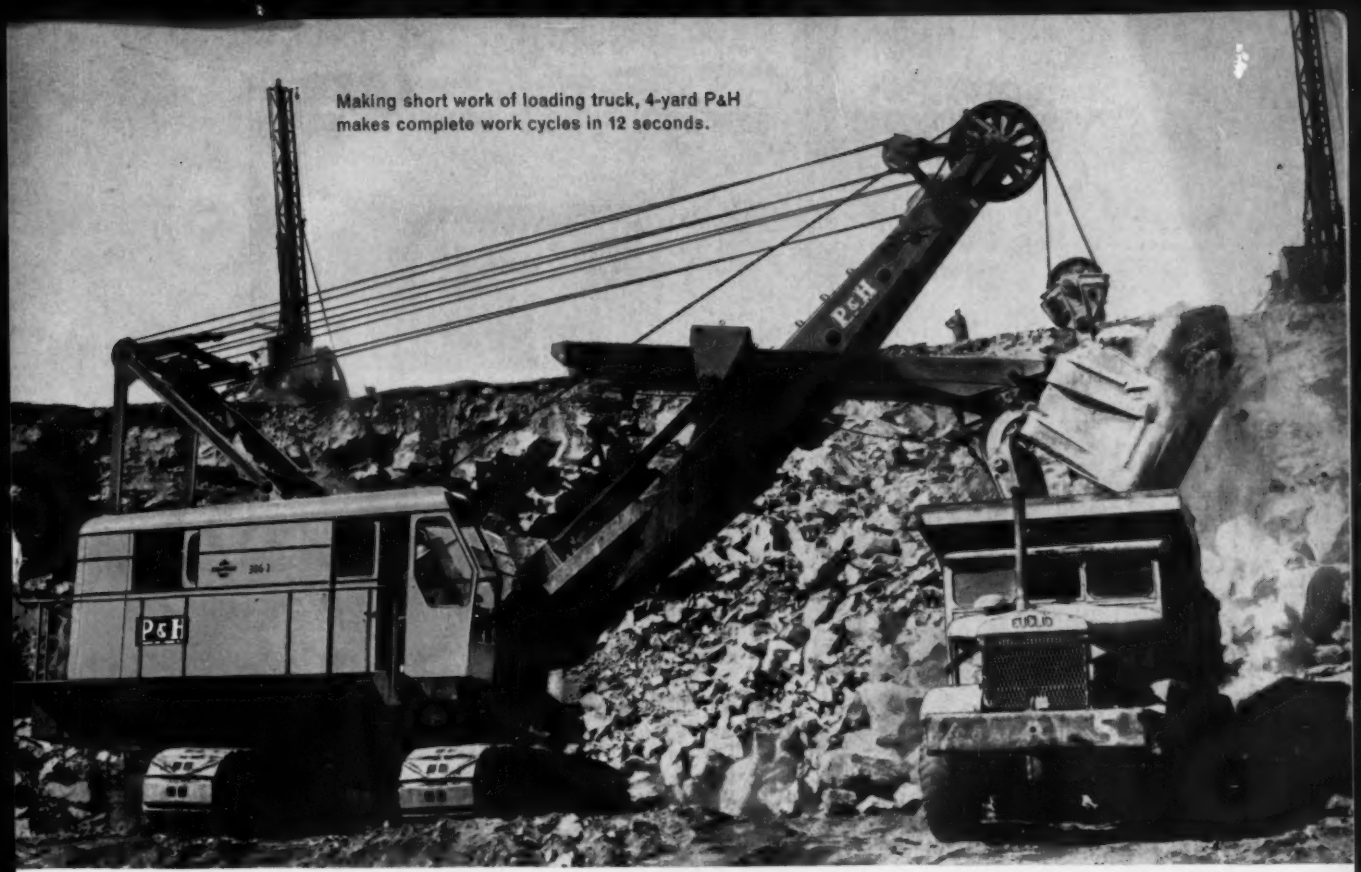
AA to D Frames

1½" to 12"

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—P.O. Box 635, Paoli, Pa.
Representatives throughout the World

HYDROSEAL *and* CENTRISEAL
SAND, SLURRY & DREDGE PUMPS

MAXIMIX RUBBER PROTECTED

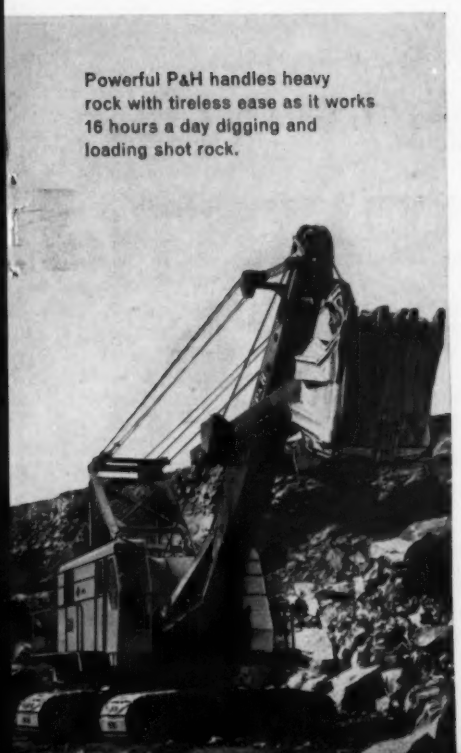


Making short work of loading truck, 4-yard P&H makes complete work cycles in 12 seconds.

Magnetorque swingers are the reason . . .

"4 yard P&H out-produces two 2½ yard shovels"

. . . STOCKBRIDGE STONE COMPANY, Atlanta, Georgia
Division of VULCAN MATERIALS COMPANY



Powerful P&H handles heavy rock with tireless ease as it works 16 hours a day digging and loading shot rock.

J. G. Lambert, Superintendent, has this to say about his operation— *"Our 4 yard P&H shovel, with Magnetorque swingers, accounts for more than half of the yardage produced at our Fortson quarry. It actually produces more than both of our other 2½ yard shovels combined."*

12 to 15 seconds work cycles. Stockbridge Stone supplies aggregate throughout Georgia, Alabama, and to four company-owned plants that manufacture concrete blocks and ready-mix. Of prime importance to them is the speed and dependability with which their shovels can excavate rock and load trucks to keep their processing plants in production. This company reports that their P&H shovel loads 18-ton trucks in 5 or 6 passes with work cycles averaging 12 to 15 seconds.

Edward Pitts, operator of the P&H says that Magnetorque swingers are the reason he gets better than 25% faster work cycles. He points out that Magnetorque swingers, unlike friction-type clutches, never over heat, and are not affected by temperature changes or load size.

P&H works two 8 hour shifts per day. To meet the heavy demand for aggregate, Stockbridge operates their 4-yard P&H shovel on a 16-hour day . . . and they operate in all types of weather, even the heaviest rains. This company has proven to itself that P&H delivers exceptional performance under the most rigorous conditions—steady, fast cycles with no downtime other than normal preventive maintenance.

Another feature, "Bud" Lambert stresses, is the propel brake on the P&H—this brake control gives more productive working time because it eliminates the constant need to "dog" or "undog" the machine with clumsy jaw clutches for every move.

For more information on this job, write for Case History 136.

HARNISCHFEGER P&H
Milwaukee 46, Wisconsin

Mining Calendar

Northwest Mining Association Convention, Davenport Hotel, Spokane, Wash., Dec. 2-3, 1961

Symposium on Mechanization of Mines, international meeting and equipment show, Central Mining Research Station, Dhanbad, Bihar, India, Dec. 9-12

Beneficiation and Agglomeration Symposium, 23rd annual symposium of the University of Minnesota, dealing with taconites, pellets and iron ores. U. of Minnesota, Minneapolis 4, Minn. for details. Meeting to be held in Duluth, Jan. 15-17, 1962

AIME annual meeting, New York City, Feb. 18-22, 1962

International Symposium on the Ferroalloy Industry in India, National Metallurgical Laboratory, Jamshedpur-7, India, February 1962

Computers and Computer Applications to Mining and Exploration, workshop and symposium, Stanford University and University of Arizona, at Tucson, March 26-30

Pacific Southwest Minerals Industry Conference, sponsored by the San Francisco, Nevada and Southern California sections of AIME, Palace Hotel, San Francisco, April 12-14, 1962

American Society for Metals, regional conference and exhibition, Houston, Tex. (Shamrock Hotel), April 17-19, 1962

Pacific Northwest Regional Minerals and Metals Conference, AIME-ASM, Benj. Franklin Hotel, Seattle, Wash., April 26-28

5th Rock Mechanics Symposium, sponsored by Colorado and Missouri Schools of Mines, Penn State and U. of Minnesota. At U. of M., Minneapolis, May 3-5, 1962

Wyoming Mining Assn., annual convention, Jackson Lake Lodge, Wyo., June 8-9, 1962

Coming Up

Salute to Flotation — The editors have surveyed the leading figures in the field of flotation — pioneer and present-day — for a story of flotation and the men who made it, many of them discussing it in the pages of E&MJ decades ago.

Their history, along with the present state of the art and some indications of the future, will appear in the December issue.

Zinc-Lead in Belgium — How Vieille-Mongagne separates nine-odd minerals from a tightly-integrated base metal plant. The complete story, plus the flowsheets which illustrate careful control, will appear next month.

95th YEAR OF PUBLICATION

ENGINEERING AND MINING JOURNAL

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Tranquilizers for pipes that shake like this

HERE'S a sure cure for pipes that get rattled when the pressure's on. Install a B.F.Goodrich connector between the pipe and the pump. A connector is a short length of rubber hose used to join sections of pipeline. The soft, thick rubber absorbs vibrations. Cuts out banging and noise. Increases pump life, avoids costly broken connections.

In a midwest zinc plant, pipe on a hot acid line had to be replaced 2 or 3 times a year. Vibration from the pump shook the pipe until it banged, rattled, cracked. Then a short length of the lead pipe was replaced with a BFG Flexseal connector. Its cost $105. And it saved the customer $1000 in the first year alone by eliminating the cause of broken connections, frequent repairs, costly pipe replacements.

In addition to *Flexseal*, B.F.Goodrich has recently announced a new heavy-duty connector, called *Flexlock*, which is built to take working pressures up to 150 lbs. Both Flexseal and Flexlock are made with abrasion and acid-resisting rubber. Both provide full flow connections. Both can be ordered with or without wire reinforcement.

B.F.Goodrich distributors can give you complete details on B.F.Goodrich Flexseal and Flexlock connectors. And as factory-trained specialists in rubber products, they can answer your questions about any of the products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-183, Akron 18, Ohio.*

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Articles in this issue of

ENGINEERING AND MINING JOURNAL

Continued from p 2

85 What Is Happening to Silver?

For one thing, the price is going up, and will continue to rise for some time. Silver is subject to a number of pressures well beyond the usual ones of supply and demand.

It is also subject to some controls: notably the "free stocks" held by the U.S. Treasury. But that control is rapidly disappearing as domestic U.S. consumers tap the stocks for silver at the currently low price of 90½c per oz. By early spring, most experts believe, the "free stocks" will be gone and silver consumers will be bidding up the price in the marketplace.

The editors have interviewed and visited all parties to this latest eruption in the historic role of silver in the economy and coinage of the world, and offer a 15-page special report, starting on p 85.

Producers and consumers find themselves in agreement on several points of the current question, judging from their public and private statements, and coming closer together on others. As one miner put it, "It's no fun battling with your own customers, and it won't be going on much longer."

The dénouement of the present "crisis" will come when the Treasury's free stocks are gone. Then, other pressures will move the price up. What might happen to domestic and foreign mines (and even domestic and foreign coinage) is documented in the special report.

99 Air Classifiers Increase Recovery From Furnace Residues

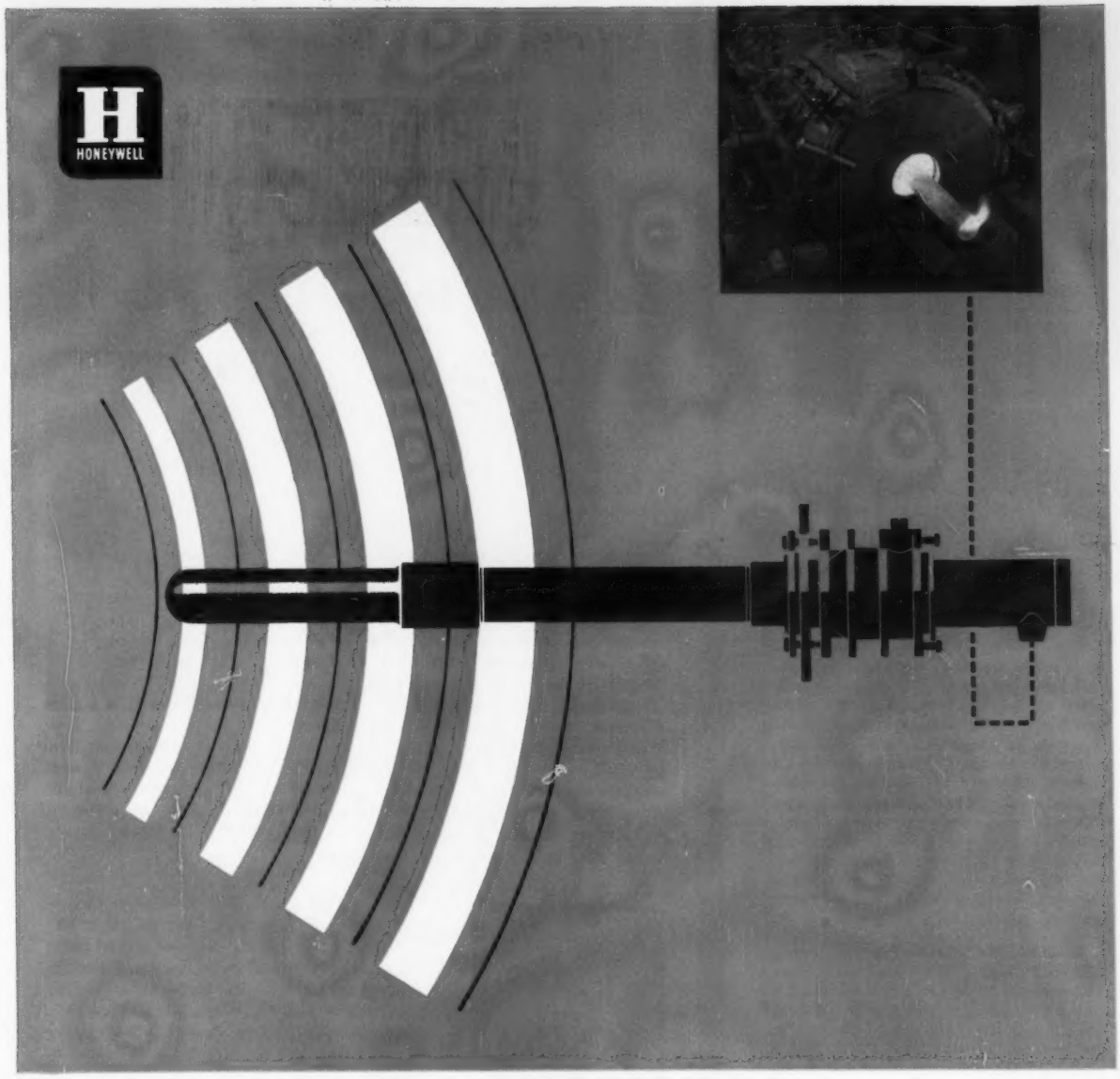
In order to get better magnetic separation of zinc furnace residues, the American Zinc Co. installed an air classification system ahead of the magnets. Now the coarse fraction from each air classifier is passed through separate magnetic separators which separate magnetic iron-gold-silver-copper concentrates from non-magnetic material rich in zinc and carbon. Formerly magnetic separation was incomplete because an insufficient number of iron-bearing particles were subjected to the magnetic force and because non-magnetic material was entrapped and carried away with the magnetic material. How these classifiers work is the subject of the story.

102 Detonation of Ammonium Nitrate in Small Holes

The Colorado School of Mines measured the velocity of various AN-FO mixes under various conditions and reached the following conclusions. For small diameter holes, a fine-grained product is superior to coarse grained-products, especially if the mix is not too dense. A 6% fuel-oil mix is ideal but it is better to have a little too much than too little oil. Any amount of moisture damages the mix, but plastic bags can keep water out and CSM says, the shorter the bags the better. Any high-velocity primer will do, but the AN should be packed tightly to the primer—a little air might cause a misfire. Other results are in the story.

104 Belt Conveyors Speed Placer Mining

Harold Schmidt, who has been taking gold from Alaska and the Yukon for 25 years, has outlined a fast, low-cost method for placer mining. Basically, it consists of mobile conveyors, a sluice box and a dozer or two.



Specify Radiamatic Infrared Detection Systems for dependable, economical temperature measurement and control

For more than 20 years, Radiamatic Infrared Systems have been giving reliable, accurate service in every area of industrial temperature measurement and control. Over the years, Honeywell has developed special infrared techniques and equipment for a wide range of applications, including soaking pits, kilns, heat treating, induction and forging furnaces.

The key to the high accuracy and low cost of these systems is the Radiamatic Infrared Detector. Available in many different models with a full line of accessories, these detectors measure temperatures from 200°F. up to 7000°F.

For complete information on how Radiamatic Infrared Systems can solve your temperature measurement and control problems, call your nearby Honeywell field engineer. Or write Minneapolis-Honeywell, Wayne and Windrim Aves., Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell

First in Control

SINCE 1885

HONEYWELL INTERNATIONAL Sales and service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

95 YEARS OF MINING

The following news items are reprinted substantially as they first appeared in the AMERICAN JOURNAL OF MINING, the publication which became *E&MJ*.

NEVADA, JULY 1867—The Virginia City *Evening News*, says that there is "h—ll to pay at the Overman mine." As far as we can judge, the trouble originated in the desire of the trustees in San Francisco, or the Superintendent in Virginia, or both, to speculate in the stock of the company. As the two departments of administration didn't work well together, there were several changes made in the superintendency within a few weeks. The last superintendent was accused of having caused the stock to advance, without informing anybody but his friends that such would be the case. Developments which he made sent the price of stock from $40 to $300, to the surprise of the trustees. He was removed; but some of the stockholders, who liked to see the shares at $300, supported the former officer in refusing to surrender the mine to the new appointee. A good old-fashioned shindy was narrowly avoided; but the police, temporarily taking sides with the old incumbent, restored peace, and the struggle is transferred to newspapers, courts, and stockholders' meetings.

CANADA, MAY 1867—The Oil Springs *Chronicle*, May 9, says: Last week about 150 persons, headed by a few well-known characters, made a raid on the Richardson mine, in the Township of Madoc, for the purpose of ascertaining whether it really contained the precious dust in the quantities represented.

ARIZONA, MAY 1867—The Apache Indians had attacked the men in charge of Mowry mine, killed one and wounded several. Oscar Buckalew, nephew of United States Senator Buckalew, of Pennsylvania, was seriously wounded. Five Indians were killed and a number wounded. The savages were armed with guns and rifles.

MISSOURI, JUNE 1867—A reader writes, "I have never seen a mine in the the State (St. Joseph's Lead Co.) more complete in all its appointments. Over fifty buildings have been erected comprising dwellings, workshops, an office and a store. They have one Scotch hearth, one slag and three reverberatory furnaces. Forty-horse power engine drives a Blake crusher, a set of Cornish rolls, a circular screen, six double sieves, a fan for Scotch hearth and slag furnace and two pumps, one of which pumps the mine and the other supplies the dressing floors with water . . ."

This month in

ENGINEERING AND MINING JOURNAL

Continued from p4

Behind the By-Lines

Because it's November, that's why.

We don't often get a chance to run a picture of a pretty girl, and when we do, by gum we're gonna' do it. When the question of what pretty girls had to do with mining came up, our old friend the beachcomber observed "pretty girls have everything to do with everything."

Actually, we're on pretty firm ground. The damsel on the right is Miss Sue Huston, Good Right Arm of the public relations department of Asarco. For the past couple of years, Sue has been visiting various Asarco properties and doing stories on properties and personnel for the company's ASARCO NEWS.

Her most recent trip was to the Coeur d'Alenes, where Asarco is operating the Galena silver-base metal mine. Armed with notepad and camera, the intrepid Sue spent a long, hard day, and eventually got to the lowest workings of the mine. We don't know if the old superstitions about women going underground still prevail, but if the question were left up to us, and if the lady in question were Sue, we're sure we'd decide it just the way the boys at Galena did.

Our second guest, and a worthy one, is Miss Diana Hogg, a geology major at the University of Saskatchewan and one of three girls who attended this year's annual session of the Lac La Ronge Prospector's School, sponsored by the Provincial government.

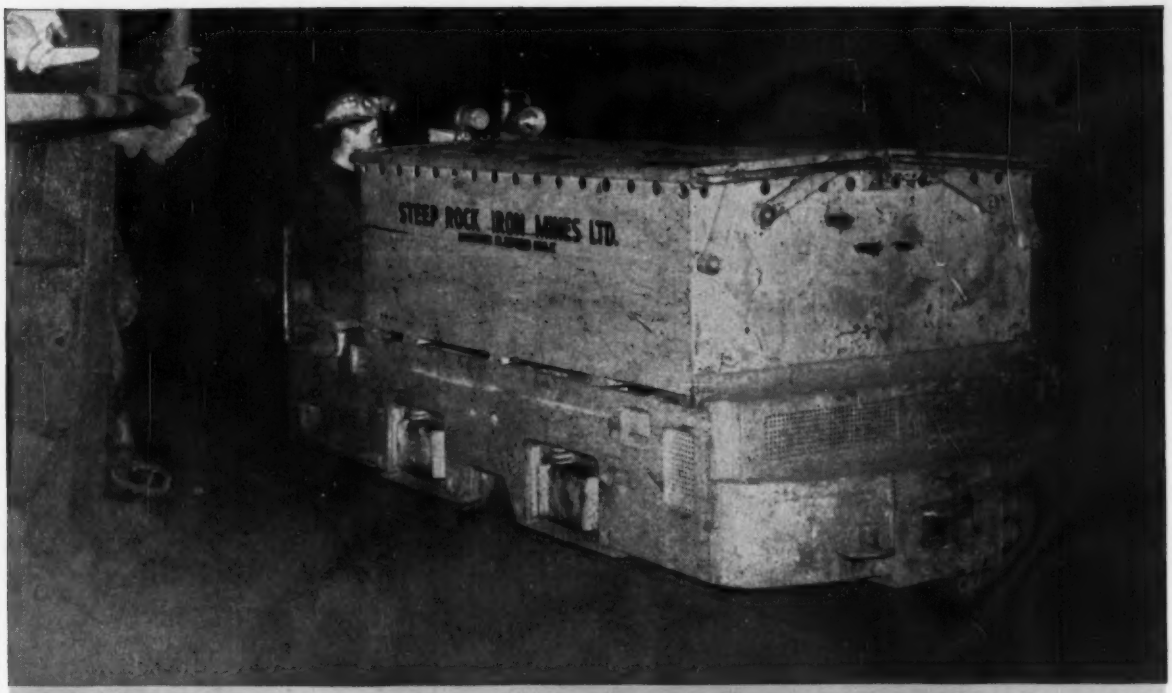
Miss Hogg, (shown checking out on an Atlas Copco lightweight drill) is another welcome addition to the ranks. In fact, as far as we're concerned, this can become a trend anytime the gals are ready.

Since we're on the subject, it seems fitting to toss in two items we've come across this month, if only to assert our masculine independence and resistance. The first is from the Huber-Warco employee magazine and the second is a verbatim news story from the Louisiana JOURNAL.

"A beautiful chorus girl was awarded $10,000 in a breach-of-promise suit. Soon after, she was hit by an automobile and had six ribs broken. She was awarded $25 by the same court for damages. Moral: Don't play around with a woman's heart. Kick her in the ribs."

"The ladies of the Cherry Street Church have discarded clothing of all kinds. Please call at 44 North Cherry St. for inspection."

The picture on the right? Same girl as above, but after the full day's tour of the Galena property.



Development haulage problem solved with MANCHA storage battery locomotives

***customized* for Steep Rock Iron Mines, Ltd., Ontario**

When Steep Rock's Underground Mining Department analyzed standard face loading cycles in development headings, it was decided that efficiency could be considerably increased by using a larger capacity car than normal.

After careful study, a 13 ton capacity drop-bottom car design was selected. Four cars would carry a full round, appreciably reducing car change time at the face . . . a major cause of delay in normal loading operations.

Snapping these large, heavy cars in and out behind the loader would obviously be extremely hard on the locomotive so Mancha custom designed a special heavy duty model capable of withstanding such use. All the special features called for by the Steep Rock Safety Department were carefully incorporated . . . insuring complete protection for the motorman, maximum operating efficiency and low maintenance.

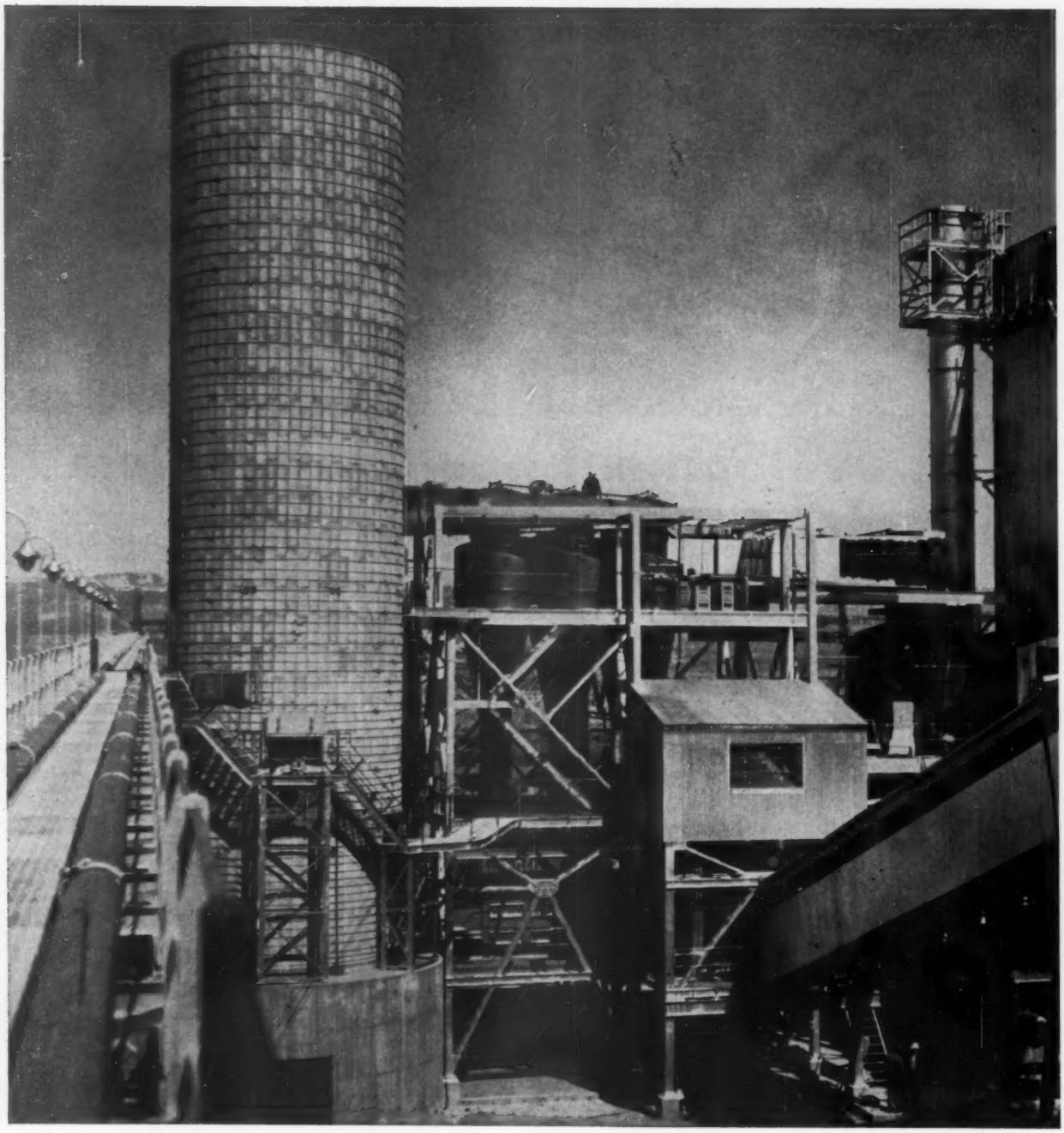
Result—the Mancha Standard ABX with the right specifications and special features for the job—

Operating weight—7 tons
Motor—21 hp
Running speeds—3-6 mph
Direct connected axles to prevent wheel spinning
Protective shield for motorman's cab
Hood over controller
Manually operated quick-acting hydraulic brake
Dead man foot switch protection
Provision in motorman's cab for radio
Heavy duty camtactor controller
Oversize axles, gears and journal bearings

Mancha specializes in underground haulage locomotives and welcomes the opportunity to discuss your problems and requirements. May we have a representative call?

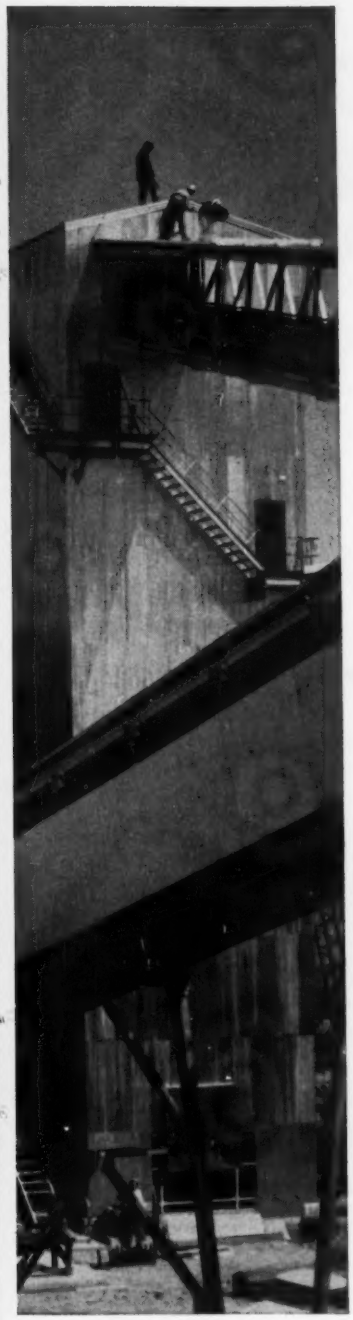
MANCHA STORAGE BATTERY LOCOMOTIVE

DIVISION GOODMAN MANUFACTURING COMPANY
Halsted Street and 48th Place • Chicago 9, Illinois •
Cable Address: Mancha, Chicago
Mancha representatives are located in principal mining areas throughout the world.



USS Columbia-Geneva Steel Division selects FluoSolids® drying

at major coal preparation facility



The FluoSolids dryer placed on stream in mid 1960 at the United States Steel Corporation's giant new coal preparation facility at Wellington, Utah marked the second major USS installation to select this most advanced drying technique. The new unit followed the successful operation of two 14′ I.D. dryers at a major East Coast coal preparation plant.

Located adjacent to the ten story high structure in the foreground, the FluoSolids Dryer at Wellington is removing 25 tph of water from 800 tph of 1½″ x 0 metallurgical coal destined for steel making at Geneva Works near Provo, Utah.

First introduced by Dorr-Oliver in 1954, FluoSolids has enjoyed phenomenal success and has caused a revolution in thermal drying of coal. And the basic simplicity and efficiency has remained unchallenged to date.

The compact, unitized design conserves space, simplifies operation and realizes maximum use of heating BTUs. Burning pulverized coal automatically extracted from the drying compartment, the FluoSolids system provides rapid start-up and shut-down . . . no fuel is consumed during shut-down as with banked stokers. Control is accurate and automatic and quickly responds to varying feed conditions. Hot air supplied to the drying compartment is pressurized, no exhaust fans being needed to handle hot, dirty gases. Uniform product control is assured through automatic feed rate adjustment and temperature control. Positive humidity control conditions give uniform drying. Compared with other systems, lower air volumes are required with corresponding savings in horsepower.

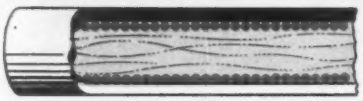
Applicable to a wide variety of tonnages and feed sizes ranging from filter cake on up to 1½ x 0 coal, the Dorrco FluoSolids system is the most advanced equipment available to meet today's demands for automation and efficiency in economical preparation plant operation. For complete information, write Dorr-Oliver Incorporated, Stamford, Connecticut.

DORR-OLIVER

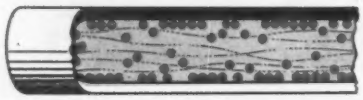
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

LUBE LOGIC

Tips for more efficient equipment performance



Rust inhibited oil protects by "plating" metal surfaces with additive shield.



Adding straight mineral oil disturbs this plating effect.

For best rust protection, don't mix straight mineral oil with additive-type hydraulic oil

When you find it's time to add makeup oil to a hydraulic system filled with rust-inhibited oil, make sure you don't use straight mineral oil as makeup.

Reason why: the rust inhibitors in a fortified oil, such as Regal Oil R&O, prevent rusting by "plating out" on metal surfaces, sealing them against air and moisture. The presence of this film depends on a chemical equilibrium in the oil, and it will give optimum protection only as long as this equilibrium is maintained. If you add straight mineral oil after an original charge of rust-inhibited oil, you'll disturb this chemical balance, and some of the "plated out" inhibitors will go back into the oil. How much "plating" you lose depends on how much straight mineral oil you add, of course, but even a tiny bit of rust can scratch precision pump parts like gravel. So, don't take chances; stick to rust-inhibited oil in your hydraulic systems.

Location of automatic air line oiler determines how well it works

Automatic air line oilers work best when they're located not more than ten feet from the air tool they're lubricating. Some operators put the oiler right at the end of the air pipeline, with up to 50 feet of hose between the oiler and the air tool. That's *not* the way to do it. Automatic oilers operate by spraying a fine oil mist into the air stream. The air will carry the oil just so far, and then the oil begins to hang up inside the hose. The drill gets only a fraction of the oil going into the system, so you use a lot of oil and still get inadequate lubrication.

With only ten feet of hose between the oiler and the drill, the oil can atomize properly but hasn't a chance to hang up inside the hose. Thus you lubricate the drill thoroughly, and use far less oil in the long run.

1. PLAN FOR PROFIT — Texaco's newest color-and-sound movie. Dramatizes the major savings you can make with the proper investment of less than 1% of your total budget — the amount you spend on lubricants. Film features latest lubrication methods and equipment on a number of actual locations, demonstrating the Texaco Simplified Lubrication Plan in action.

2. FUNDAMENTALS OF LUBRICATION — a brand new Texaco color slide film. A clear, concise once-over that defines technical terms like "viscosity" and explains specifically what lubrication is and what it does. This down-to-earth discussion will give the lubrication man a new understanding of the importance of lubrication, and a fresh interest in his work. It's supplemented with a manual that covers the same ground in greater detail.

3. LUBRICATION OF EARTHMOVING EQUIPMENT — a new slide film, in color. A concise, easy-to-understand analysis of proper lubrication of engines, wheel bearings, steering, track rollers, crawler treads, hydraulic equipment, wire rope, open and enclosed gears. Supplemented with a manual that covers the whole field of earthmoving equipment lubrication in further detail.

FOR AN EARLY SHOWING of any one of these films — or all of them — contact your Texaco Representative *now*.

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1 **A rugged shredded wire barrier** that fights body-penetrating cuts, reduces separation, retards cut growth and serves as a cushioning bridge between the carcass and the tread. This means you have a tougher, longer-lasting tire that pays off in more service!

2 **An extra-thick tread** with up to 71% more nonskid tread than conventional tires! This gives you more miles for your dollar, more heft and traction on tough jobs!

3 **Exclusive 3-T processed Nylon Cord,** triple-tempered by Tension, Temperature and Time to make bruise-breaks and blowouts all but a thing of the past!

All these features add up to increased tire life, lower cost-per-mile—for not one penny extra! Prove them for yourself. See your Goodyear dealer for Hard Rock Lug Xtra Tred tires—today!

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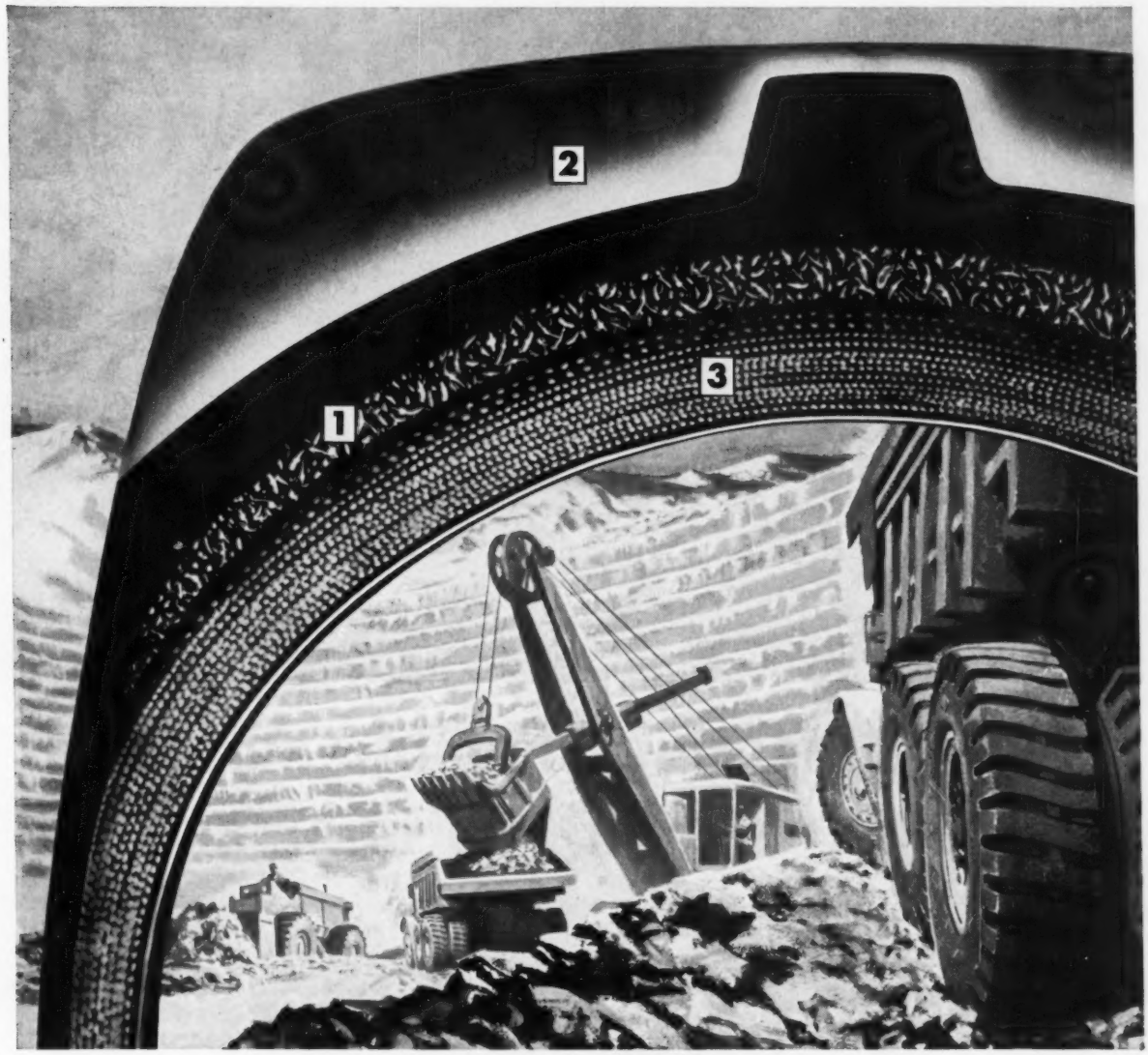

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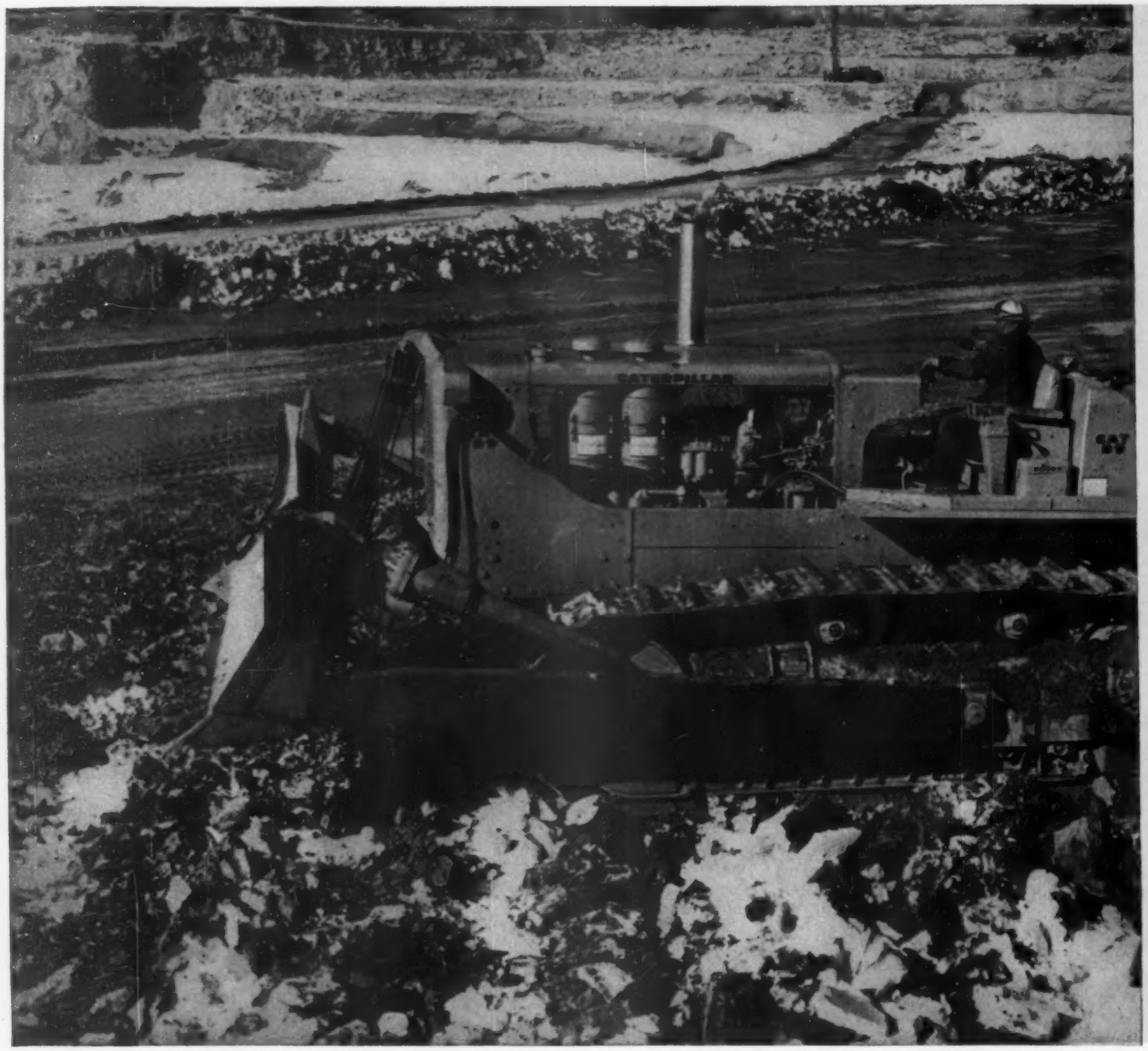

If you're blasting rippable material, your money's going up in smoke

Mining operations are getting quieter. The reason is that more and more owners are replacing expensive blasting of ore and overburden with relatively inexpensive ripping.

The silence will never be complete, of course. Some material is simply not rippable, even with the brute strength of the big Caterpillar D9E Tractor.

But where material *is* rippable, it is considerably cheaper to rip than to drill and blast. Simple arithmetic supplies the most important reason. Add up these costs: power source, compressor, drills, drill bits, labor and supervision for drill and powder crews, dynamite truck, powder and primer, insurance, access roads and benching for drilling equipment.

Then compare the total with the owning and operating cost of a ripping tractor.

And there are other cost-saving advantages in ripping:

1. Ripped pieces of material tend to be smaller than blasted pieces, which means easier, faster handling and increased production. The spacing, depth and direction of ripping passes can be varied to obtain the desired size pieces, eliminating

HOW RIPPING WITH A D9E SOLVED A DIFFICULT AND UNUSUAL MINING PROBLEM

Mining of the main deposit had been completed at a uranium mine—but an excess of 50,000 tons of commercial grade ore still remained in scattered lenticular deposits around the bottom of the pit. They varied in depth from two to six feet, some occupying areas as great as 1000 square feet.

Problem: how to mine them economically.

Blasting would have been uneconomical since the commercial grade ore would have been diluted with surrounding low-grade ore and waste material. Shovel excavation without prior shattering would have been extremely slow, if possible at all.

Engineers suggested trying a tractor-mounted ripper. Tests indicated that this was the answer, and mine supervisors ordered a Caterpillar D9E Tractor with power shift transmission. Attachments included a No. 9 Ripper with two teeth and a No. 9S Bulldozer with tilt cylinder to give added prying action in digging out ore chunks in the more heavily consolidated portions of the formation.

The material is first ripped to a depth of 28 inches on 4-foot centers. Then it is cross-ripped (shown in photo at left) to break the heavily consolidated ore into easily handled pieces for shovel loading. The D9E bulldozes the pieces into a pile for loading into hauling units. Ripping and bulldozing production averages from 300 to 500 cu. yd. per hour. In addition the D9E handles road maintenance.

No other machine is as well suited to this kind of rugged mining work as the D9E. With 335 HP (flywheel) and a massive, long-lived undercarriage, it has the power and stamina to do the job. But, more important, it can do the job at *reasonable cost*. For the D9E's rugged construction and dependable Cat Engine mean that it stays on the job hour after hour, day after day, doing the work you bought it for.

Talk over your ore and overburden removal problems with your Caterpillar Dealer. If it is his best judgment that Cat-built equipment is the answer—he's ready to prove it to you with a demonstration.

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expensive and time-consuming secondary blasting.

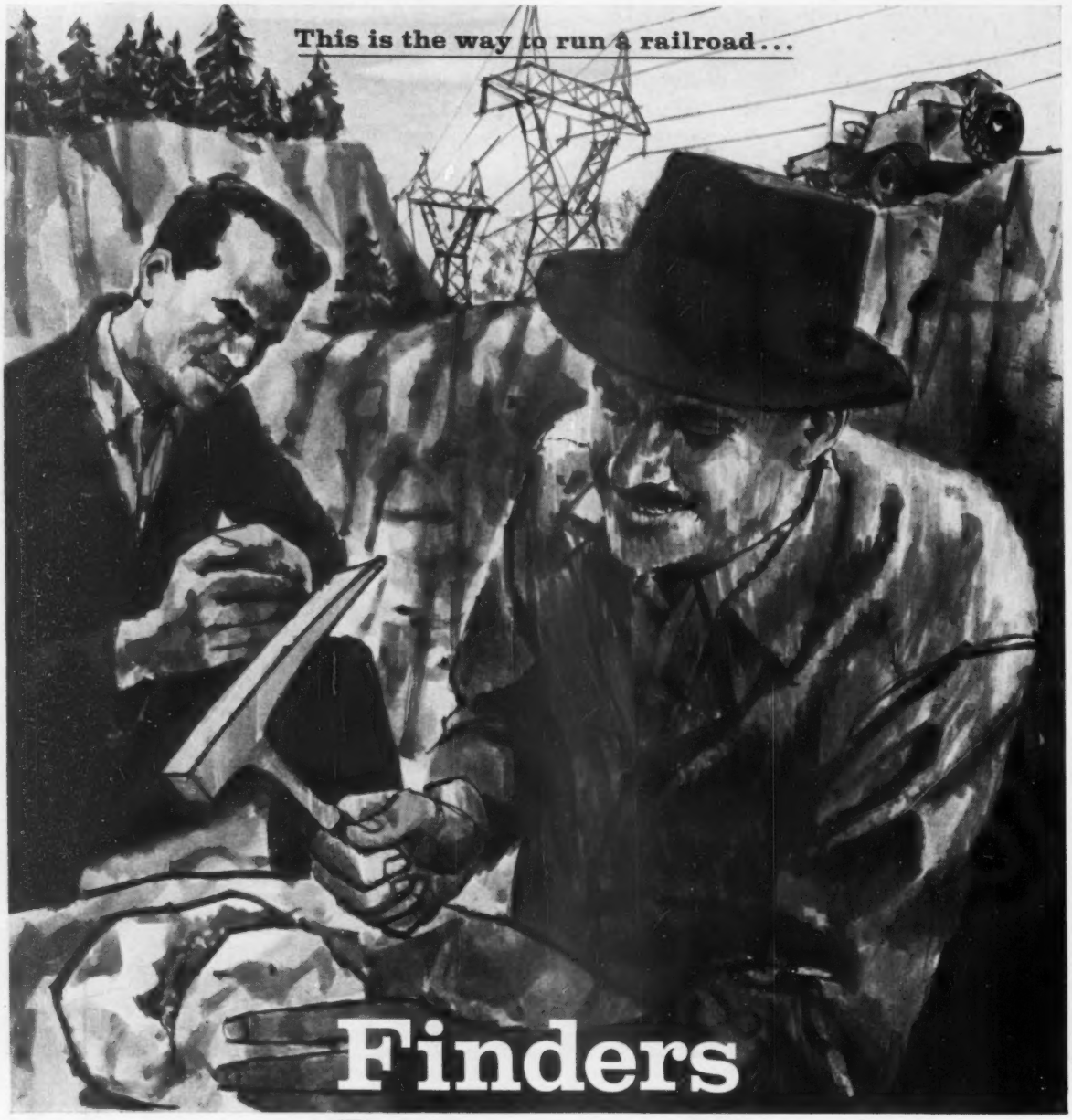
2. Ripping is safer than blasting. And in many cases this can mean lower liability insurance rates.

3. A ripping tractor offers the extra dividend of availability for various bulldozing jobs when it has completed its ripping assignments.

All told, the savings can be quite considerable. In fact, it is a rule of thumb that a ripping tractor used on a production basis can loosen ore and overburden for one-third to one-half the cost of drilling and blasting. In many cases, savings even top that. For example, on the Mesabi Range rock was ripped with D9s for *10% of the cost of drilling and blasting*.

The chart below gives some examples of typical savings. All are actual cases where Caterpillar track-type Tractors with rippers replaced drilling and blasting.

LOCATION	MATERIAL	Ripping Costs (Cents/Cu. Yd.)	Drilling and Blasting Costs (Cents/Cu. Yd.)
Tulsa, Oklahoma	Limestone	7.3	17.3
Dallas, Texas	Limestone	5.2	15.1
San Francisco, Calif.	Sandstone	15.0	30.0
Merriam, Kansas	Sandstone	2.1	11.7
Nelsonville, Ohio	Sandstone	5.7	13.8
Philadelphia, Pa.	Limestone	11.5	19.3
Carbo, Virginia	Sandstone	8.6	15.7
Hibbing, Minn.	Frost	25.0	60.0
Hibbing, Minn.	Paint Rock	6.1	54.5



Finders leasers!

Profitable mining properties are being sought constantly by the members of the 10-man Northern Pacific Geology staff. When they strike a valuable mineral deposit, the property is made available for lease to a company interested in developing it.

More and more companies are seeking the help of Northern Pacific geologists in photogeologic study, field observations and exploration work. These valuable Northern Pacific services are available to you, too.

Or are you interested in markets and taxes? . . . or industrial sites and power? . . . possibly freight rates and services? We are ready with the facts about the railway, the resources and the territory we serve. Write to P. D. Edgell, General Manager, *Properties and Industrial Development Department*, Room 811, Northern Pacific Railway, St. Paul, Minn. Your inquiry will receive prompt, confidential attention.

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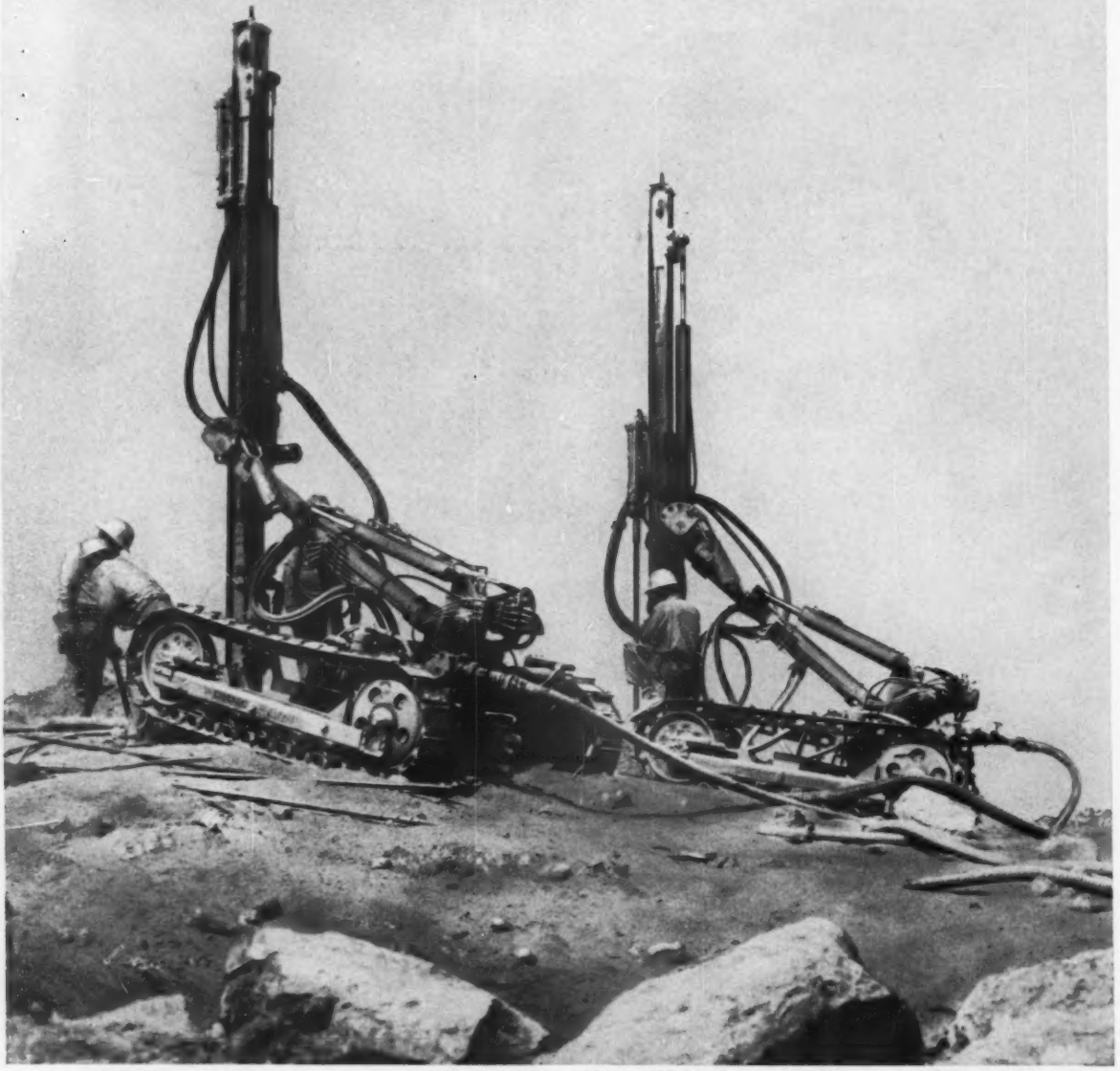
G-900 Tracdril's have earned the respect of drillers for safe, sure-footedness when "set-ups" are toughest.



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G-900 TRACDRIL

"Boarding House Reach" describes the G-900 Tracdril's ability to cover any drill pattern with a minimum number of moves. With 180° horizontal boom swing, G-900's can drill at right angles over the tracks, left or right . . . handle high horizontals to 11 feet . . . toe holes at ground level. Big, sure-footed tracks beat any ground condition . . . provide a solid drill mount. Dual drill positioning controls, at turret and boom end, assure fast, accurate spotting . . . maximum drilling time. "Dead man" controls and fully automatic brakes that slam on the instant tramming throttle is released, lock unit on steepest slopes or treacherous terrain.

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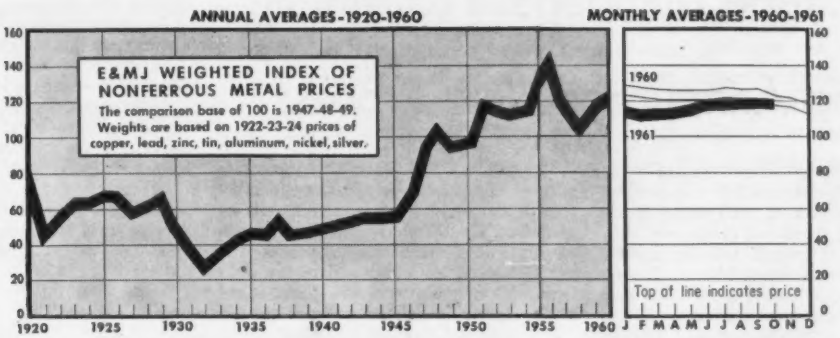
E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES-1920-1960
MONTHLY AVERAGES-1960-1961
E&MJ WEIGHTED INDEX OF NONFERROUS METAL PRICES
The comparison base of 100 is 1947-48-49. Weights are based on 1922-23-24 prices of copper, lead, zinc, tin, aluminum, nickel, silver.
1960
1961
Top of line indicates price
J F M A M J J A S O N D

MARKETS

E&MJ's nonferrous metals price index dropped slightly from 120.746 for September to 120.386 for October. Copper was shaved by 0.004¢, tin was down 0.839¢ and aluminum 1.6¢. Lead, zinc, silver, and nickel were unchanged.

•

AT HOME

A silver price increase is "only a matter of time," Dean E. F. Cook, of the University of Idaho told a meeting in Wallace. While taking a gloomy view of the future of gold, Dean Cook predicted that 1961 will show the greatest domestic silver production since 1938. (See feature article, p 85.)

The target date for "Project Gnome," the AEC-sponsored underground explosion of a 5-kiloton nuclear device near Carlsbad, N.M., is still Dec. 5, according to director John S. Kelly. Gnome, which is part of the "Plowshare" program for peaceful uses of atomic energy, will be partially devoted to study of underground shock waves. In a public relations contribution, International Minerals & Chemical Corp. sponsored an AEC seminar with local potash producers and other residents.

The end of the year will see completion of most of the surface buildings at the Inspiration Consolidated Copper Co. Christmas mine, in Arizona. The McDonald shaft is being drifted from the 1600 level toward the old No. 3 development shaft, and a third shaft, for ventilation, is also down to 1600. Some 3000 ft remain to be drifted between the two headings.

•

LABOR

James R. Hoffa, head of the Teamsters union, characterized the current probe by the Senate Internal Security Subcommittee of a Teamster-MMSW pact as an "anti-union" attack. MMSW defended the pact on a "mutuality of interest" basis and said the agreement would provide labor stability. They called the Teamsters "one of the most important unions" in nonferrous mining and said the pact would aid in going after unorganized mines.

•

ABROAD

Brazil's minister of mining and energy, Gabriel Passos, was reported on Nov. 1 to have announced his intention to withhold authorization for any mining project where the capital is less than 51% Brazilian in the state of Minas Gerais. Among projects which would be affected by such a ruling are several iron ore exporting operations, including that of M. A. Hanna Co.

Following an unsuccessful search for sulphur deposits within its borders, India is now planning an intensive pyrites mining program to supply sulphur. Present consumption of sulphur is 200,000 tons—all imported—and demand is expected to increase three-fold in the next five years.

THIS MONTH IN MINING

Low Grade Manganese to MnO_2; Sterling Announces New Process

STERLING OIL OF OKLAHOMA INC., of Tulsa has acquired exclusive rights to a process for the production of high purity manganese dioxide from low grade ores and, as a result, has entered into an interim agreement with Century Mining Co. of Arizona for the lease of 350,000 long tons of manganese ore over a 5-year period. Total consideration will run to an estimated $7-million.

Not only does this mark the first major manganese ore contract since the Federal Government's stockpiling program was terminated in 1959, but the contract also signals the opening of a commercial use for low grade domestic manganese ores. Previously, the only source of MnO_2 has been foreign deposits of chemical-grade manganese ores for which the U.S. is reliant principally on Ghana and Morocco.

Century, the operating subsidiary of Twentieth Century Mining Co. of Fort Worth, has 39 manganese claims covering some 780 acres in the immediate vicinity of Bouse, Ariz. The company also has claims in the area east of Phoenix. Its deposits include both low-grade complex and metallurgical grade manganese ore.

Twentieth Century's president, J. B. Williams, reports that four of the claims in the Bouse area have been extensively core drilled and these alone indicate about 1.7-million tons of manganese ore.

Shipments of the ore are to begin upon completion of a $1.75-million manganese dioxide treatment plant by Sterling. Construction is to get under way in 1962. A small prototype plant is now being built and is expected to be in operation by mid-December.

Details of the MnO_2 process are secret. However, it has been described as "a continuous hydrometallurgical process utilizing nitrous oxides." And it can economically treat ores which contain as little as 15% manganese by dry weight.

Under terms of the agreement, Century will extract and concentrate ores at its 1200-tpd heavy media plant which has been virtually idle since it was erected in 1960. Century had purchased the mill from Mojave Mining Co. which had operated it at Wenden, Ariz. The mill, including a 50-ton crushing section, was disassembled and moved to Bouse by Century.

No site has been announced for Sterling's manganese dioxide plant, but it is presumed that it would be situated close to Century's mill.

Upon startup of Sterling's chemical plant, ore deliveries from Century will proceed at an average rate of 1400 tons weekly. An interpolation of this ore requirement and other data indicates that Sterling's annual MnO_2 capacity will be approximately 35,000 tons.

Century will not have to concentrate ores of 15 grade or better. (Ore grade refers to the number of long ton units of contained Mn by dry weight per long ton of ore. The figure also approximates the percentage of Mn contained in the ore.) Ores of less grade would be beneficiated at the Bouse facility to at least the 15 level. The mining company will size the ores to minus-6 in.

As rental-royalty, Sterling will pay Century on the following basis:

30 grade or better manganese ore by dry weight—$0.82 a long ton unit.

23-29 grade or better manganese ore by dry weight—$0.75 a long ton unit.

12-22 grade or better manganese ore by dry weight—$0.65 a long ton unit.

In each instance these prices will be less $3.50 a long ton. For example, rental royalty on a long ton of 30 grade manganese ore by dry weight would be $21.10 (30 x $0.82 = $24.60 —$3.50).

Prices are F.O.B. Century's mill at Bouse, Arizona,

AEC Revises Uranium Purchase Forecast; Johnson Places Tonnages Downward

THE ATOMIC ENERGY COMMISSION has revised its forecast of how much domestically-produced uranium it will buy. Jesse Johnson, head of AEC's raw materials program, says that purchases through to June 30, 1967, will be off as much as 10,000 tons of U_3O_8 contained in yellow cake.

Industry observers are expected to demonstrate during the next few weeks in testimony to a Raw Materials Subcommittee of Congress's Joint Committee on Atomic Energy that this deficit may be nearer 15,000 to 20,000 tons.

Although Johnson's statements are contained in a report to the Joint Committee, his views have not been publicized by the AEC. He asserts there will be no deficit in foreign purchasing as a result of shortfalls in deliveries.

Johnson's estimates are based on ore reserves as of Nov. 24, 1958, in the U.S. According to Johnson, as of Jan. 1, 1961, the U.S. had ore reserves of 82-million tons with recoverable uranium amounting to 230,000 tons. The economic price of this uranium is between $8-$10 a lb, although AEC in its 1962-1966 domestic procurement program will not buy uranium for more than $8 a lb.

The 82-million ton ore-reserve figure contrasts with 78-million tons with 210,000 tons of U_3O_8 recoverable. However, these figures cannot be related to the current procurement inasmuch as 1962-1966 purchasing is based on the Nov. 24, 1958, cut-off date.

Johnson said that there already has been a fall away in excess of 2500 tons of U_3O_8—even though the nation's producers have not formally entered the 1962-1966 program. He blames this on failure of some domestic mills to produce the full contract quantity scheduled for delivery in the 1962 period. "These failures resulted from delays in bringing mines into full production, lower grade ore than anticipated, failure of ore supply or milling problems," he said.

Johnson did not elaborate on the internal problems of the program, but it is apparent that demise of some mills, increases in haulage costs, end of bonus payments and related factors accompanying the cutback in procurement, exploration, etc., also are responsible.

In some cases, mills are receiving less in the remaining months to the start of the 1962-1966 program than in past—as a result of renegotiation of contracts. This squeeze was particularly acute on mills with no captive ores and on non-captive producers, observers said. Also, overly generous ore reserve estimations in some areas, and much less generous estimates in others, began to take effect. There are some mills without sufficient ore supply to carry them through to March 31, 1962.

Johnson, in an apparent extrapolation of the situation as it now exists, said that "estimates of post-1962 production which were made in 1959, on the basis of the Nov. 24, 1958, cut-off date, have been revised downward by approximately 5000 tons of U_3O_8."

In short, the 5000-ton U_3O_8 figure is now a certainty. It is apparent that there could well be added fall away of procurement. This would result because of economics. A principal area could be the Grants District of New Mexico where water and mining costs are causing serious economic problems, some of which have been resolved in sales and mergers.

A current pressing point in the industry is transfer of allowables under the reserve allocation system as it becomes apparent that mining costs, milling charges and other economic factors are beginning to assail segments of the industry—despite the so-called "stretch out."

Johnson says he doesn't believe a $5-a-lb price for domestic uranium in post-1966 is realistic, points out inferentially that many are in trouble now at current quotations.

Original estimate of domestic purchase in the 1962-1966 program is 110,000 tons, with added 50,000 tons coming from foreign sources. A short fall of 10,000 or 15,000 tons of uranium is

equated to millions of tons of domestic uranium ore at an average grade of 0.20% U_3O_8.

The economic implications of this are not lost on the western mining states or the companies involved.

Getchell Reactivates Mine; Merges with American Chrome Operation

CURRENT ACTIVITIES at the Getchell mine of Getchell Mine Inc., near Redhouse, Nev., are centered in a $2.5-million program to convert its inactive tungsten operation back into a gold producer. Reserves of gold ore available both underground and in pits are large. Stripping to enlarge existing pits is in progress and remodeling the concentrator flowsheet for treatment of complex gold ore is progressing according to schedule. Treatment will include roasting of ore in a FluoSolids reactor followed by conventional cyanidation. Operations are geared for a 1500-tpd production. The company hopes to have the property in full production by early summer 1962. Operations are directed by Wm. H. Hisle, general manager. He is assisted by A. J. Graves, chief engineer; Clare Chamberlin, mine superintendent; J. V. Stanford, mill superintendent; and Reeve Fagg, maintenance superintendent.

Goldfield Consolidated Mines Co., which owns 42.6% of Getchell, said that, besides reactivating the gold mine, the directors have approved a merger with American Chrome (87.5% Goldfield-owned) whose Mouat chrome mine recently closed.

Manager John Bley of American Chrome said mining ceased Sept. 29 and the mill closed in Oct. as delivery was completed on 90,000 tons of chrome on a Government contract. The mine and mill will be placed on a standby basis, Bley said. About 100 men will be affected by the closing of the operations.

"It's hard to say," Bley replied when asked when the mill might reopen, "we're still working with the Government to convert the present stockpile into ferrochrome. We've made some headway, but we have some distance to go.

"It will be several months before the mine will be reopened," he said, "and there's no guarantee even then."

Molycorp Sponsors Program In Research of Rare Earths

A NEW research project on the utilization of the individual rare earth elements has been started at Pennsylvania State University, University Park, Pa. under the sponsorship of the Molybdenum Corporation of America, according to Marx Hirsch, president of Molycorp.

(This Month continues on p120)

As We Went to Press . . .

Mining industry spokesmen denounced the Wilderness Bill at a hearing held in McCall, Idaho by the House Public Lands Subcommittee in late October. Roger McConnell, chief geologist for Bunker Hill, asked for mineral appraisal of the lands before withdrawal since the areas have had "little or no appraisal" of mineral possibilities.

H. F. Magnuson of Golconda Lead attacked the "flagrant example" of special interest legislation and noted that an area equal to that of the State of Idaho is at stake. Robert P. Dwyer, Wallace attorney, said the bill would not assure a continued right to prospect and A. J. Teske, Idaho Mining Assn., also attacked the "wide variation of interpretation" which the bill permits.

The Utah State Land Board has also filed objections to the bill with the House Interior and Insular Affairs Committee.

Development of some 50-million tons of Idaho phosphate is planned by International Minerals & Chemical Corp. and Husky Oil Co. on lands near Soda Springs owned by Husky. The agreement allows up to five years for development of final plans for the joint venture and provides for sale of the deposits to IMC if, for any reason, Husky should decide not to enter the project.

Cerro Corp. is planning development and production from the Cobriza copper deposit, located on the Great Bend of the Mantaro, some 50 miles southwest of Huancayo, Peru. Ore reserves of some 3-million tons of 3.7% Cu have been proved by 3500 meters of drilling.

Operation of the property will be by Minas de Cobriza, incorporated in early September by Cerro.

Initial milling of 500 tpd is proposed at the minesite, with concentration by selective flotation. Concentrates will be shipped to the smelter at Oroya.

A favorable report by the USBM is apparently the prime condition for construction of the much-publicized steel mill at Anaconda, Mont., to be built by Gulf States Lands and Industry Corp.

Rep. Arnold H. Olson (D.-Mont.) said the report on the economic feasibility of the project, which would treat the mountain of slag alongside the old Anaconda smelter, was due October 31.

The freshman Congressman said that Gulf States assured him that it would have no trouble raising the $31-million required for the project once approval was received.

English Oil Co., of Salt Lake, has claimed a "major discovery of gypsum" on the west flank of the San Rafael Swell in Emery County, Utah. J. A. Minton, president of English, said the deposit is "of remarkable thickness, purity and extent." The firm has staked and leased 15,000 acres to cover the deposits.

Development of a copper deposit which Polish officials have characterized as "the largest in the world," is planned by Poland under an agreement with Czechoslovakia. Czech money (112.5-million rubles) will be loaned to develop the 2000-ft deep deposit at Lublin, in Western Poland. The Poles are investing 18-million zlotys after a geological study of the deposits which covered a period of eight years.

On completion of the project, officials say, Poland will switch from an importer of copper to a producer of 120,000 tpy of electrolytic copper.

Discovery of a "mountain of iron" is claimed in El Salvador by two engineers—Henry Chollat and Jorge Emilio Hertz—who were quoted in the Guatemalan press as forecasting construction of a $26-million iron and steel plant.

WASHINGTON IMPACT

Highlights

CONGRESS IS OUT, BUT MINING HEARINGS CONTINUE. A series of hearings is being held this month by a joint Senate-House Committee to investigate the possible collapse of the uranium industry when and if the Government turns off the purchasing tap in 1966. More than $2-billion in atomic energy procurement contracts with some 25 domestic uranium mills, covering the 1961-1966 period, will halt.

The hearings will be held outside of Washington in actual mining centers. Here are the locations and the dates: Riverton, Wyo., Nov. 13; Moab, Utah, Nov. 15; Grants, N.M., Nov. 16, and 17. Rep. Wayne Aspinall (D-Colo.), is chairman of the raw materials subcommittee.

CONGRESS, WHEN IT CONVENES in January, will also have a pile up of work to do on metals and mining legislation. At least three stocks of strategic stockpile metals have been submitted for Congressional release approval. The six-month waiting period for initial sales by General Services Administration for these metals is already well underway. If Congress takes action to give routine approval for the sales, then GSA will be doing a brisk business in the early spring. The big one is the 50,000 tons of tin. GSA wanted Congress to release 10,000 tons of this stock right away before it adjourned this fall, but no action was taken. There is also a stock of 265,000 lbs of cobalt oxide and 5500 lbs of cobalt carbonate waiting under the six-month waiting ruling. Now GSA says it wants to dispose of 1890 tons of chromite and 18,700 long tons of tin slags which contain columbium and tantulum pentoxide. Sales for all these will come in a rush around the latter part of March and early April.

METALS AND MINING are becoming increasingly tied with U.S. aid. With Africa and Latin America looming as the two biggest spots for massive U.S. aid (minimum of $5-billion for five years), mining projects in one form or another are looming as projects high on the recipient countries' shopping lists. A developing country nowadays wants aid for mining, if it has mining, and wants an "instant metals" plant whether it has a mining industry or not.

Argentina is the latest example of this trend. When Argentine president Arturo Frondizi talked with President Kennedy before the U.N. opening session, the communique that followed made vague talk about projects in Argentina's pampas for a hydro-electric project at "El Chocon." Now, word has it that Argentina wants and will probably get U.S. aid to build a 900,000 kilowatt hydroelectric system along the Rio Negro with part of the power going to Buenos Aires and a big part of it to remain in the desolate region for development industries.

Argentina wants companies to come in on the pampas (northern Patagonia) development plan to use up the electricity. Kaiser Aluminum is reportedly dickering with the Argentines to move in with a $150-million aluminum plant to be constructed up the Rio Negro near the town of Neuquen. A direct-reduction steel plant is also planned to go up at the mouth of Rio Negro on the bay of San Matias. Two European outfits, Thyssen and Ferrostahl are interested in this "electricity user."

Elsewhere, Koppers and some U.S. banks are still hopeful to put up another "instant metals" plant in Nigeria. A direct-reduction steel plant, costing $81-million is on Nigeria's project list. U.S. aid is the key. In Ghana, after much political backing and filling the U.S. is expected to come across with long-promised aid for that country's Volta River hydro-electric dam and 141,000 ton yearly capacity aluminum plant in a consortium headed by Kaiser. U.S. aid, again, is the key for this project.

In Bolivia, U.S. aid, via the Inter-American Bank, is working to reorganize the badly disorganized tin mines—from the mine shifts on out to the miners' comissaries. At least $10-million is going into this project right now. IAB hired mining consultants C. C. Huston and Associates of Canada to help straighten out Bolivia's mines. Money is going into new equipment, replenishing squandered commissaries and into legal severance pay for release of non-productive workers. The deal is that Bolivia gets the money—only if it takes long needed reform steps.

Subsidy Relief for Small Pb-Zn Miners Becomes Law

PRESIDENT KENNEDY finally signed into law the HR-84 Relief Bill for small lead and zinc miners. The bill, originally proposed by Rep. Ed. Edmondson (D-Okla.) was passed through Congress just before adjournment. The new law will give $16.5-million in price subsidy relief over a four-year period to lead and zinc miners who mine less than 3000 tons yearly (included both lead and zinc tonnages).

U.S. negotiators at the International Lead-Zinc Meeting in Geneva (late last month) were collared by nervous foreign lead-zinc producers who didn't like the idea of subsidizing more production, even though it would come via the small miners bill. U.S. lead-zinc experts told foreign producers that quotas will remain the same and, therefore, the new subsidy won't hurt them. The subsidy might very well hurt one group, those U.S. miners whose yearly production amounts to just a little more than 3000 tons of lead and zinc. The law has not been received with unanimous approval by Western States.

Stockpile Idea Redefined As GSA Overhauls Its Own

GENERAL SERVICES ADMINISTRATION and the various strategic and non-strategic stockpiles it manages is becoming "one of the world's biggest mines," an industry spokesmen said in a joking description of the increasing metals activities of the Government.

Metals in all forms are coming up for sale or are being upgraded by processing for more stockpiling. One item for sale recently was an offering of "high duty" spark-plugs. These spark-plugs were hastily drawn into the stockpile as the Korean "police action" grew into a good sized war. The U.S. began to quickly lay hands on all kinds of metals for a strategic stockpile.

Often these metals came in unrefined or odd-lot manufactured forms. Now, they are being sold in the manufactured forms and upgraded in the unrefined.

The sparkplugs total 184.70 troy oz of 99.9% rhodium sponge and there is another bunch of 109.74 troy oz of 99.9% rhodium powder. The rhodium comes from the end of the ends of the spark-plugs. It is an important item for electroplating, resistors and spark-plug tips for high-duty use. The chemical industry uses the stuff as a catalyst.

Government officials counter the GSA "world's biggest mine" levity with the description of Western Electric Co. being one of the world's largest lead mines. When the company took its lead cable coverings out and replaced them with plastic sheathing, it found it had a mountain of lead to contend with. From time to time the company digs into its lead

"mine" and moves into the market with it.

The whole idea of stockpiling, is being given another look now—both on the Government and private sides—with the idea that if there ever is an atomic war, stockpiles can be used for "re-building" instead of the original conception for waging war.

Navy Develops New Non-Magnetic Alloy

NAVY SCIENTISTS, working on all forms of metals and alloys for things such as rockets and space metals on down to under-water submarine warfare alloys, have come up with a new combination in non-magnetic alloys. The Navy says the alloy will serve underwater demolition crews and even housewives in the kitchen.

The alloy is called Nitinol by developers in the magnetic materials division of the Naval Ordnance Laboratory at White Oak, Silver Springs, Md. Based on the intermetallic compound of titanium and nickel, Nitinol works as a corrosion resistant and can be hardened to almost the fineness of tool steel. It is strong and tough, the Navy claims, having been tested up to 43 ft-pounds impact strength. Nitinol is claimed to differ from other non-magnetic alloys in that its toughness increases as temperature decreases. But it is still workable for use up to 1200 degrees F. It can offer strength, without adding weight to aircraft (specific gravity of 6.45).

Many of these properties will give Nitinol, the Navy hopes, direct application for minesweepers and for making tools for underwater ordnance work.

Nitinol is supposed to have an extremely valuable property the Navy will need in possible future "submarine versus submarine" warfare and underwater missile and torpedo detection. It has a very high mechanical vibration capacity at room temperature which decreases rapidly as temperature is decreased. This marked change in its mechanical vibration damping characteristics that accompanies temperature change makes the alloy a good possibility for underwater temperature sensing devices.

The Navy is now pushing its "submarine versus submarine" program on the theory that U.S. Polaris missile atomic subs could soon be prime targets for Soviet "killer" subs.

Up from the depths, the Navy also says Nitinol, if it ever is produced in commercial quantities, could be used by a housewife for stainless cutlery because of its "lustrous finish and sharpness for hardened cutting edges that should remain almost indefinitely."

The Navy's own research on a titanium or titanium-clad submarine is still under study, according to reports. An all-aluminum sub is also to be developed for extreme depth by Reynolds Metals Co. and Electric Boat Co.

Labor This Month

CONGRESS SCANS MINE-MILL-TEAMSTER PACT: In hectic two-day hearings, members of the Senate Internal Security Subcommittee last month probed the new alliance between MMSW and the Teamsters Union. Basis for the investigation lies in the Committee's charge that Mine-Mill is "Communist controlled" and that the pact opens the way to Communist invasion of the transportation industry. The hearings, which may be a forerunner to a Congressional search "in depth" of the joint union agreement, produced countercharges from Teamster chief James R. Hoffa and Mine-Mill officials that the probe is an "anti-union" attack.

Leaders of both unions defended their alliance as a straight mutual aid arrangement to help in collective bargaining, in jurisdictional disputes and in organizing—with no political overtones. To charges by Subcommittee chairman James O. Eastland that Mine-Mill is Communist-controlled, Hoffa snapped there was no Government "proof" of this and he would continue to support it unless the Mine-Mill officials convicted of filing false non-Communist Taft-Hartley oaths were found guilty in their current appeal.

Mine-Mill leaders, in turn, cited "mutuality of interests" as the basis for the agreement. They argued that instead of raising a threat to the nation, it actually would provide "greater stability of bargaining relationships" because of the multi-union representation in the copper industry. Noting that the Teamsters have become "one of the most important unions" in nonferrous mining—in Arizona alone the IBT hauls ore at seven of 10 organized pits—Mine-Mill officers said the deal would help to ease the conflicts existing between some dozen unions in the industry. They said they were ready to sign similar deals with other unions and, as a starter, the Teamster-Mine-Mill pact would be used to go after the unorganized mines.

Subcommittee members, apparently unconvinced by the defense of the pact, indicated that they may later conduct a full-fledged investigation. According to Eastland, a previous committee warned that "an alliance of certain racketeer and Communist dominated unions as a threat to national security . . . is coming to pass. In my own judgment, hearings in depth should be held to uncover just what has been happening in this regard."

The committee hearings turned up one clear-cut distinction in the policies of the two unions. Under questioning, Irving Dichter, MMSW secretary-treasurer noted that Communists are not barred from Mine-Mill membership if they work in the industry. IBT chief Hoffa, in turn pointed to the Teamster constitution which reads: "No member of the Communist party nor any person who subscribes or lends support to its doctrines, shall be allowed to hold membership in any local union of the international organization." Hoffa denied there were Communists in the Teamsters union: "If you have proof you ought to give it to us," he told the committee.

FORERUNNER TO NONFERROUS BARGAINING: Early clues to what to expect in Mine-Mill's 1962 bargaining are beginning to show up. An on-the-spot survey of wage conditions by MMSW leaders in Western mines is intended to spell out the different wage patterns existing between Arizona, New Mexico, Utah and Nevada. A union spokesman notes that Kennecott Corp. has eliminated 75% of the wage differentials in these states. Mine-Mill appears to be leaning towards a demand on Anaconda Corp., American Smelting and Refining and Phelps-Dodge that they follow the Kennecott pattern.

WHITE HOUSE PRESSURES LABOR NEGOTIATORS: An off-the-record session of AFL-CIO economists got a warning word from a top Kennedy Administration economist recently on keeping down wage demands. The blunt advice—which angered the unionists—was to keep wage hikes within the bounds of average productivity. Escalator clauses—which hike wages with the rise in living costs—were ruled out. Labor strategists indicated they aren't ready to buy such restrictions but are wary, as one official pointed out, that such unwelcome advice from the Administration "can tie our hands when we go to the bargaining table."

MARKETS

U. S. Lead Price Cut ½c Under LME Pressure; Copper Market Steady; Aluminum Stocks Rise

THE E&MJ INDEX OF NONFERROUS METAL Prices for October was 120.4% of the 1947-49 average, down from 120.7% the previous month. A lower aluminum price, in effect the entire month, was responsible. Minute declines in copper and tin prices were hardly noticed. The Metals Use Index October estimate was 105% of the 1950 average, up a point from the September preliminary.

The U.N. Lead-Zinc Study Group met in Geneva toward the latter part of October, supposedly with the primary mission of doing something about the oversupply of lead. It took no action and as a result the LME quotation tumbled to the equivalent of approximately 7½¢. U.S. buying, which had been fairly good over the past few months, faded as consumers waited for the inevitable. It came on November 1 when Asarco cut its N.Y. price from 11¢ a lb to 10½¢. Other sellers followed.

Ironically sales for the week immediately preceding the cut were the best since the last week of July. It was another case of foreign markets bringing heavy pressure to bear on a not unhealthy U.S. market. The industry could hardly stand another price cut; but when smelters can no longer move intake, they cannot afford to stock at high prices.

Some observers feel the U.S. subsidy to small lead-zinc mines has dampened enthusiasm for cutbacks, but at 10½¢ a lb some producers are approaching the break-even point and would appear to have little choice. Quotas do not include fabricated products. When the U.S.-London spread gets wide enough, transportation becomes economical. The price is considered rock bottom, but so was 11¢.

Zinc has not shared in lead's pricing difficulties. No action was expected to come out of the Study Group meeting and when none came there was no reaction. The U.S. market has improved steadily in recent weeks. Prime Western sales to galvanizers continue to lead the way but premium grade sales to die casters for automotive purposes has improved.

Industry statistics have been impressive and a chance of a price rise remains, but the problem of discounted premiums for special grades persists. Premium grades have been selling at or very close to the PW price in recent weeks owing to heavy stocks accumulated during the automotive slow season. Informants believe full paper premiums will have to be returned before a rise in the PW price is possible. They are guessing that this will not come before the end of the year. The American Zinc Co. strike ended (5,000 tpm).

The copper market in October was quieter and steadier than it has been in any month for several years. A slowdown in European buying has counteracted what would normally be a strong U.S. price situation.

Domestic activity in copper continues very good and if the current pace continues, record consumption should be registered. Statistics for September on both producer and fabricator levels were cheering, with producer refined stocks down nearly 20,000 tons and fabricator shipments and sales again increased. The U.S. producer-smelter price of 31¢ a lb delivered continued and now is expected to hold through the end of 1961.

A 60-day truce in Anaconda's Chilean labor negotiations was scheduled to end early in November. The company must also look ahead to December 31, when its contract at Chuquicamata runs out.

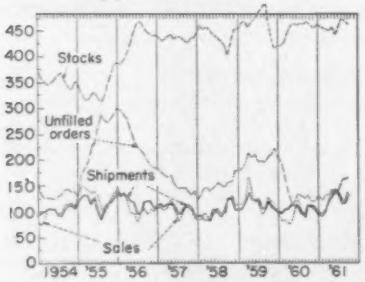
Primary aluminum output in September was 159,572 tons (78.2% of capacity), compared with 167,040 (79.2%) in August. Shipments have failed to improve as production has been returned, and as a consequence industry stocks have moved up. At the end of August they were almost identical to those of December 1960 after fair gains in the spring. However, experts are forecasting an excellent fourth quarter, with one seeing shipments for the year 4% improved. They were about even at the end of August.

With U.S. demand for silver well ahead of supply, U.S. Government free silver stocks have been dwindling. With the end of this stock in sight, industry factions have been vocal in their demand for Government assistance. The entire situation is reviewed elsewhere in this issue. By way of summary, the U.S. producer wants the highest possible price; the U.S. consumer the lowest. The producer would like Government sale of silver to halt so prices—which will inspire needed new output—can move up slowly. They wish to retain compulsory, fixed-price buying by the Government. Refiners are seeking to end Government buying, in the belief that prices will level off after an initial period of inflation. They want the Government to continue selling while they gird for higher prices. A free market on the topside is coming. Refiners will strike for one on the bottomside when Congress reconvenes.

The International Tin Council met in London on October 9, and again adjourned without taking any action on restocking the Buffer Stock or adjusting its price levels. Bolivia announced that if no action was taken at the next meeting in February, the producing members might withdraw from the Agreement and establish their own organization.

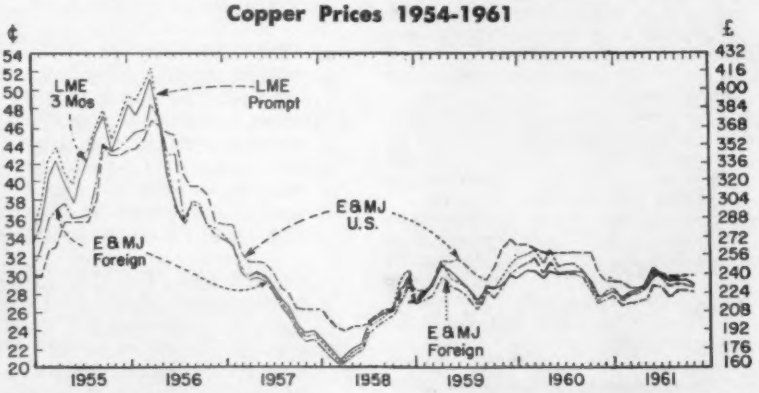
The U.S. attended, but nothing was said as to intention to join. Nor was any mention made of the 50,000 tons of U.S. stockpile tin which GSA asked permission to sell, terming it "excess to defense needs." Congress adjourned without approving the release, but it should get early attention in January.

U.S. Copper Fabricator Data



Data in thousands of short tons from U.S.Copper Assn. The sales and shipment series are related only to purchases of refined copper by the fabricators, including copper refined by custom smelters from their intake of scrap and concentrates. All statistics refer to brass mills, wire mills and foundries. All series are for fabricated products except stocks which are of refined copper and copper in process. September is the last month indicated. Sales and shipments series are two months moving averages.

Copper Prices 1954-1961



Monthly averages. E&MJ weighted averages are computed from actual reports of sales to E&MJ — normally 140,000 to 170,000 tons per month. LME prices are the average of the mean of the bid and asked; they refer to long tons. The two scales are equal at an exchange rate of $2.80 per £. £320 is 40c a lb, etc. Data through October 1961.

Average Prices October (E&MJ Quotations)

Cents per lb unless otherwise indicated:

Copper:	
Electro, domestic refinery	30.600
Electrolytic, exports refinery	27.875
Electrolytic, c.i.f. Cont'l ports	28.820
Lead:	
Common, New York	11.000
Common, St. Louis	10.800
Silver:	
Silver, New York, per oz.	91.375
Silver, London, pence per oz.	79.864d
Zinc:	
Prime, Western, East St. Louis	11.500
Prime, Western, delivered (g)	12.000
Tin:	
New York Straits	121.042
Gold, per oz., U.S. price	$35.000
Sterling Exchange	281.535
Quicksilver, per flask	$188.619
Antimony, (E&MJ) (d)	36.250
Antimony, bulk Laredo	32.500
Antimony, in cases, Laredo	33.000
Antimony for, 99% (h)	28.250
Palladium, troy oz.	$24.000
Platinum, refined, per oz.	$82.000
Cadmium (a)	160.000
Cadmium (b)	170.000
Al 99½% unalloyed ingot	24.000
export ingot	23.250
Magnesium, ingot	35.250
Nickel (f)	81.250
Bismuth	$2.250
Cobalt	$1.500

Domestic quotations, unless otherwise stated are in cents per lb. Sterling exchange checks, in cents. Quick-silver per flask of 76 lb.
(a) Per lb delivered, ton lots.
(b) Per lb delivered, small lots.
(d) Domestic 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(f) Contract price, f.o.b. Port Colborne U.S. duty included.
(g) Delivered where freight exceeds 0.5c.
(h) 2c duty extra.

Free Gold Market

Trading volume in international markets closed by 3½% with coin prices rising 1 to 2% and bar prices up fractionally. Russia has sold 15 to 20 tons of gold in London, while mainland China delivered 1¼ tons to Hong Kong buyers. Daily volume of gold futures transactions in Swiss and London markets totalled $2½-million, with forward premiums for 6 month delivery at 6½% p.a. against dollars and about 5% p.a. against Swiss francs. U.S. gold stock dropped to a 22-year low of $17.3-billion, down $151-million during the month. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	Coins Sept. 30	Coins Oct. 31	Bars Sept. 30	Bars Oct. 31
New York transit			$35.29	$35.30
Manila	$42.15	$42.35	36.25	36.40
Hong Kong	48.25	46.65	39.10	36.70
Bombay	57.20	58.50	54.50	54.75
Beirut	42.05	41.65	35.37	35.40
Paris	42.15	42.60	35.75	35.60
Buenos Aires	41.80	42.00	35.70	35.65

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Custom Smelter Copper

Based on flat price and E&MJ average price sales in U.S. for month of October reported by American Smelting & Refining Co. electrolytic copper in standard shapes, adjusted to nearest ⅛¢; ¼¢ deducted for selling common.

Delivered consumer's plant	30.750 lb
F.o.b. refinery	30.350 lb

Major Metals

U.S. DAILY AND AVERAGE PRICES

Cents per lb unless otherwise indicated:

Oct. 1961	Electrolytic Copper (a) Domestic	(b) Export	Europe c.i.f. (e)	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Unalloyed Ingot 99%	Straits Tin New York
2	30.600	27.325	28.270	11.000	10.800	12.000	11.500	24.000	121.500
3	30.600	27.275	28.220	11.000	10.800	12.000	11.500	24.000	121.500
4	30.600	27.375	28.320	11.000	10.800	12.000	11.500	24.000	121.125
5	30.600	27.375	28.320	11.000	10.800	12.000	11.500	24.000	120.875
6	30.600	27.475	28.420	11.000	10.800	12.000	11.500	24.000	120.500
9	30.600	27.950	28.895	11.000	10.800	12.000	11.500	24.000	121.125
10	30.600	27.750	28.695	11.000	10.800	12.000	11.500	24.000	121.625
11	30.600	27.700	28.645	11.000	10.800	12.000	11.500	24.000	121.125
12	Holiday	28.025	28.970	Holiday					
13	30.600	28.225	29.170	11.000	10.800	12.000	11.500	24.000	121.125
16	30.600	28.275	29.220	11.000	10.800	12.000	11.500	24.000	120.875
17	30.600	28.275	29.220	11.000	10.800	12.000	11.500	24.000	120.625
18	30.600	28.125	29.070	11.000	10.800	12.000	11.500	24.000	120.375
19	30.600	27.950	28.895	11.000	10.800	12.000	11.500	24.000	120.625
20	30.600	28.200	29.145	11.000	10.800	12.000	11.500	24.000	120.375
23	30.600	28.100	29.045	11.000	10.800	12.000	11.500	24.000	120.125
24	30.600	28.000	28.945	11.000	10.800	12.000	11.500	24.000	120.375
25	30.600	27.925	28.870	11.000	10.800	12.000	11.500	24.000	120.875
26	30.600	28.025	28.970	11.000	10.800	12.000	11.500	24.000	121.625
27	30.600	28.025	28.970	11.000	10.800	12.000	11.500	24.000	121.625
30	30.600	27.975	28.920	11.000	10.800	12.000	11.500	24.000	121.625
31	30.600	27.900	28.845	11.000	10.800	12.000	11.500	24.000	122.250
AVERAGES FOR MONTH									
Oct.	30.600	27.875	28.820	11.000	10.800	12.000	11.500	24.000	121.042
AVERAGES FOR WEEK									
Oct. 4	30.600	27.355	28.300	11.000	10.800	12.000	11.500	24.000	121.725
11	30.600	27.650	28.595	11.000	10.800	12.000	11.500	24.000	121.050
18	30.600	28.185	29.130	11.000	10.800	12.000	11.500	24.000	120.750
25	30.600	28.035	28.980	11.000	10.800	12.000	11.500	24.000	120.475
CALENDAR WEEK AVERAGES									
Oct. 6	30.600	27.365	28.310	11.000	10.800	12.000	11.500	24.000	121.100
13	30.600	27.930	28.875	11.000	10.800	12.000	11.500	24.000	121.250
20	30.600	28.165	29.110	11.000	10.800	12.000	11.500	24.000	120.575
27	30.600	28.015	28.960	11.000	10.800	12.000	11.500	24.000	120.925

THE above quotations for major nonferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered U.S. basis add 0.406c per pound, the average differential for delivery charges.

(b) Export copper daily quotations are weighted averages based on sales outside the U.S. reported to E&MJ. Ocean freight and 0.125c lighterage and handling are deducted to arrive at the f.o.b. Atlantic seaboard refinery quotation. On f.a.s. U.S. sales lighterage of 0.125c is deducted.

(c) The daily silver quotations reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually 0.250c below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5c per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price is $35. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

(e) The c.i.f. Continental ports quotation is arrived at by adding to the f.o.b. export quotation lighterage, and the standard conference freight and insurance. Atlantic ports to main Continental ports. Currently at 0.125c and 0.82c.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; Cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West and West effective Apr. 1, 1960, commanded a premium of 1.50c per pound over the current market for Prime Western; Special High Grade 1.75c effective Apr. 1, 1960.

(f) Prime Western delivered where freight from E. St. Louis exceeds 0.500c.

Quotations for lead are based on domestic common lead. Premiums for corroding grade have been discontinued.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Oct. 1961	Silver (c) New York	Silver London	Sterling Exchange	Gold (a) London
2	91.375	79.750d.	281.4600	250s. ¾d.
3	91.375	79.750d.	281.5040	250s. 0d.
4	91.375	79.750d.	281.4675	250s. 0d.
5	91.375	79.750d.	281.3860	250s. ¼d.
6	91.375	79.750d.	281.4140	250s. 1¼d.
9	91.375	79.750d.	281.5100	250s. ¼d.
10	91.375	79.750d.	281.5520	250s. ¼d.
11	91.375	79.750d.	281.5300	250s. ¾d.
12	Holiday	79.750d.	Holiday	250s. ¾d.
13	91.375	79.750d.	281.4925	250s. ¼d.
16	91.375	79.750d.	281.5150	250s. 0d.
17	91.375	79.750d.	281.5500	250s. ¼d.
18	91.375	80.000d.	281.6000	250s. 0d.
19	91.375	80.000d.	281.6520	250s. 0d.
20	91.375	80.000d.	281.6120	249s. 11¾d.
23	91.375	80.000d.	281.6650	249s. 11¾d.
24	91.375	80.000d.	281.6700	249s. 11¾d.
25	91.375	80.000d.	281.5700	249s. 11d.
26	91.375	80.000d.	281.6420	250s. ¾d.
27	91.375	80.000d.	281.5650	249s. 11¾d.
30	91.375	80.000d.	281.4240	250s. ¼d.
31	91.375	80.000d.	281.4620	250s. 1¼d.
AVERAGES FOR MONTH				
Oct.	91.375	79.864d.	281.535	—
AVERAGES FOR WEEK				
Oct. 4	91.375	—	281.462	—
11	91.375	—	281.478	—
18	91.375	—	281.539	—
25	91.375	—	281.634	—

Calendar Week Averages: New York Silver: Oct. 6, 91.375; Oct. 13, 91.375; Oct. 20, 91.375; Oct. 27, 91.375.

MARKETS *Continued*

London Metal Exchange Quotations

Oct. 1961	Copper Cash Bid	Copper Cash Asked	Copper 3 Mon. Bid	Copper 3 Mon. Asked	Lead Current Month Bid	Lead Current Month Asked	Lead 3 Mon. Bid	Lead 3 Mon. Asked	Zinc Current Month Bid	Zinc Current Month Asked	Zinc 3 Mon. Bid	Zinc 3 Mon. Asked	Tin Cash Bid	Tin Cash Asked	Tin 3 Mon. Bid	Tin 3 Mon. Asked
2	221½	221¾	225	225¼	62	62¼	64	64½	71⅜	71½	72⅜	72½	950	951	960	961
3	222½	222¾	225½	225⅝	62¼	62½	64⅛	64⅜	73	73¼	73⅜	73½	943	944	954	955
4	226⅜	227	228½	228¾	63¼	63½	65	65¼	73½	73⅝	73⅝	73¾	941½	942	954	955
5	229	229¼	230½	230¾	63	63½	64¾	65	72⅝	72¾	73¼	73¼	942	943	953	954
6	229	229¼	230¼	230½	63	63¼	64½	64¾	71¾	71½	72¼	72¼	939	940	949	950
9	228	228¼	228¾	229	63	63½	64¾	65	71⅜	71⅝	72⅛	73	941	942	951	952
10	226¾	227	227½	227¾	63	63⅛	64⅝	64¾	71½	71⅝	72⅝	72⅝	948	949	958	959
11	228¾	229	229¼	229½	63⅛	63¼	64⅝	64¾	71¾	71⅞	72⅛	73	941	942	952	953
12	230⅝	231	230⅝	231	62⅞	63	64½	64⅝	71⅝	71⅞	73	73½	943	944	953	954
13	232⅝	233	232½	232⅝	63⅛	63¼	64⅝	64⅞	72½	72¾	73¼	73½	944	946	954	956
16	231⅝	232	231⅝	232	63⅛	63¼	64⅝	64⅝	72	72½	73½	73¼	941	943	950	951
17	230½	230¾	230¾	231	63¼	63⅜	64⅝	64¾	72¼	72⅝	73⅜	73½	936	937	945	946
18	229½	229¾	229½	229¾	63	63¼	64⅜	64½	72⅝	72¾	73⅝	73¾	939	940	947	948
19	229¼	230	229¾	230	63¼	63⅜	64⅜	64⅞	72⅜	73	73⅞	74	940	941	948	949
20	230½	230¾	230½	230½	63⅜	63½	64⅝	64¾	72¼	72½	73¼	73½	940	942	947	947½
23	229¾	230	230¼	230½	62½	62⅝	63⅞	64	71⅜	71½	72⅝	72½	942	943	946	947
24	228¾	229	229	229¼	61½	62	63½	63¾	71½	71¾	72¼	72⅜	943	944	948	949
25	228½	228¾	229	229¾	60⅝	60⅞	62	62⅛	71	71⅛	72	72⅛	946	948	951	952
26	228¼	228½	229	229¼	61⅛	61¾	62⅝	62⅞	70¾	71	71⅞	72	953	954	956	957
27	228¼	228½	229¼	229½	61¾	62	62⅞	63	70⅞	71	71¾	71⅞	952	953	954	955
30	228¼	228½	229	229¼	60⅞	61	62	62⅛	71	71⅛	71¾	72	957	958	958½	959
31	227¾	228	228¼	228½	61⅜	61½	62⅜	62½	71¼	71⅜	72⅛	72¼	963	964	963	964
Av'g's	£228.636		£229.409		£62.622		£64.068		£71.892		£72.832		£945.330		£952.841	
Oct. avg.	£228.12s. 9d.		£229.8s. 2d.		£62.12s. 5d.		£64.1s. 4d.		£71.17s. 10d.		£72.16s. 8d.		£945.6s. 7d.		£952.16s. 10d.	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper wire basis bars, lead 99.0%, zinc 98%' and tin min. 99.7%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments, f.o.b. New York unless otherwise stated, tons of 2,000 lb unless otherwise noted. st—short ton; lt—long ton; stu—short ton unit; ltu—long ton unit, (p) duty extra.

MISCELLANEOUS METALS

October 31, 1961

Aluminum ingot, 99.9% lb		24c
Antimony, spot, lb, less than carload, in cases		36.250c
In bulk, carload lots, f.o.b. Laredo		32.5c
Imported, 10 ton min. (p), 99% Duty not paid	28c —	28.50c
Bismuth, ton lots, lb		$2.25
Cadmium, ton lots delivered, lb		$1.60
small lots		$1.70
Calcium, lb, ton lots, 98%, cast		$2.05
Chromium, 99.8% grade, lb, contract delivered	$1.15 —	$1.19
Cobalt, 97 to 99%, per lb effective 3-1-60		$1.50
Germanium, per gram, 10,000 gram lots	(d)28.15c—(c)(d)	29.95c
Indium, troy oz	$1.35 —	$2.25
Lithium, lb, 98%	$9.00 —	$11.00
Nickel, cathodes, lb (a)		81¼c
Other sales, regular sellers		81¼c
Sales by dealers, etc.		81¼c
Magnesium, 99.8% carloads, lb producer's plants, Velasco, Texas, effective Apr. 16		35.25c
Palladium, troy oz	$24 —	$26
Platinum, troy oz	$80 —	$85
Quicksilver, flask of 76 lb. 25 flasks or more	$189 —	$192
Selenium, 99 plus %, lb—(Feb. 19, 1958)	$6.50 —	$7.50
Silicon, minimum 98%, carloads, lb		19c
Hyper-pure; rod per kilo	$385 —	$407
Tellurium, lb		$5.25
Thallium, 100 lb or more		$7.50
Titanium, 99.3% plus, grade A-1, max. 3% Fe, lb (b)	$1.50 —	$1.60

(a) Effective July 1, 1961; including U. S. duty; (b) Effective Aug. 1, 1959. (c) Delivered; (d) f.o.b. plant.

METALLIC ORES

Beryllium ore, imported, 10% BeO, (b) stu; spot	$32 —	$33
term contracts	$34 —	$34.50
Chrome ore per long ton, f.o.b. cars Atlantic ports, dry:		
44% Cr_2O_3 no ratio	(a)$19.75 —	$20.50
48% Cr_2O_3 3 to 1 ratio	$35¼ —	$38
Iron ore, Lake Superior, Lower Lake ports, lt		
Old Range bessemer		$11.85(e)
Mesabi bessemer		$11.60(e)
Mesabi non bessemer		$11.45(e)
Lead (Galena), 80%, Joplin, Mo., ton		$125.16
Manganese ore—Per ltu of Mn basis 48%, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports import duty extra., (n)87c—90c. Long-term contract nominal.		
Molybdenum ore, 90%, per lb of Mo f.o.b. mines		$1.40
Columbian-Tantalum, per lb, combined oxides 10 to 1 ratio	$1.18 —	$1.25
Tungsten ore, per stu of WO_3:		
Foreign 65%, c.i.f. U. S. ports, duty extra	$16.00 —	$16.50
U. S. scheelite, f.o.b. mill	$22 —	$24
Vanadium ore, per lb of contained V_2O_5 f.o.b. mines		31c
Zinc ore, Prime, 60% concentrate, Joplin, Mo., per ton.		$68

(a) Nominal. (b) c.i.f. U. S. ports. (e) Effective 1958 shipping season.

METALLIC COMPOUNDS

Arsenous oxide (arsenic trioxide) lb, in bbl, carload lots N. Y. docks		4c
Cobalt, oxide, 72½% to 73½%, per lb, effective Mar. 1, 1960	$1.13 —	$1.18
Copper sulphate, 100 lb, effective 5-17-61		$12.50
Germanium dioxide, gm		16½c
Molybdic trioxide, technical, per lb of Mo	$1.59 —	$1.60
Imported, including 37c duty	$1.75 —	$2.05

ALLOYS

Ferrochrome 58 to 65%, per lb of Cr, (4¼% C)		24c
Ferromanganese, 74 to 76%, per lb shipping point		11c
Ferromolybdenum, 58 to 64% Mo., lb of Mo contained	$1.63 —	$1.95
Ferrosilicon, 50% per lb of Si f.o.b. shipping point		14.60c
Ferrotungsten, 72 to 82%, lb of W contained		$2.25
Ferrovanadium, per lb of V delivered	$3.20 —	$3.40
Silicomanganese, max., 1½%C, lb contracts		11.6c
Spiegeleisen, per lt, 19-21% grade	$98 —	$101

NONMETALLIC MINERALS

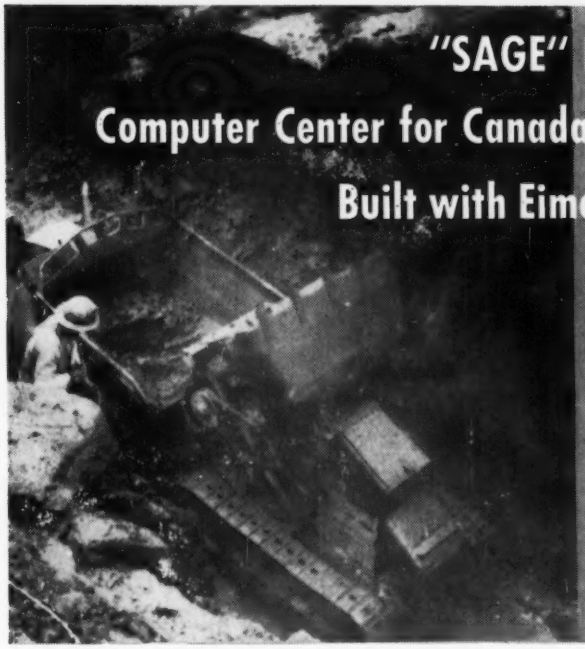
Asbestos, f.o.b. Canada (Quebec) mines (Canadian funds) ton:			
Crude No. 1	$1,400–$1,725	Paper stock	$120–$142
Crude No. 2	$750–$1,155	Waste	$75– $86
Spinning Fibers	$370– $600	Shorts	$40– $75
Shingle fibers	$180– $220		
Asbestos, f.o.b., Vancouver, B. C. (Canadian funds):			
Crude No. 1	$1,522	Spinning fibers	$470–$787
Asbestos, Vermont, f.o.b. Morrisville:		Shingle fibers	$142–$325
Spinning fibers	$353– $408	Waste, stucco or plaster	$86
Shingle stock	$181– $218	Refuse or shorts	$41– $75
Paper stock	$120– $142		
Barytes, f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94%, $BaSo_4$, per st	$16 —		$18
Crude oil well grade, min. 4.3 sp gr, st (a)			$18
Imported, c.i.f. Gulf Ports, st	$12½ —		$14
Bauxite, st, f.o.b. point of shipment:			
Imported metallurgical, per lt, f.o.b. Br. Guiana, 60% Al_2O_3, 6% SiO_3, 1.25% Fe, 1-1-60			$7.25
Feldspar, bulk ton, f.o.b. plants:			
Potash or soda feldspar, 200 mesh, ceramic grade	$17 —		$20.50
Glass feldspar, white, 20 mesh			$9
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$37 —		$41
60% effective CaF_2	$33 —		$36
Acid 97% concentrate, bulk, ton f.o.b. Ill.	$45 —		$50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 —		$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$46
Mica—Domestic, f.o.b. mines. Punch 7c-12c per lb according to size and quality. Sheet clear 1½x2 in. 70c-$1.10; 2x2 in. $1.10 to $1.60; 2x3 in; $1.60-$2.10; 3x3 in. $1.80-$2.30; 3x4 in. $2.00-$2.60; 3x5 in. $2.60-$3.00; 4x6 in. $2.75-$4.00; 6x8 in. $4.00-$8.00. Wet ground, very fine, $140-$155 per ton. Bulk sales, dry ground; $30-55 per ton. Scrap $20-$30.			
Ocher, Georgia, ton in sacks	$26.50 —		$32.00
Sulphur, Mexican, for use in Mexico, metric ton, f.o.b. mines, depending on location	$21 —		$23
For export f.o.b. vessel, depending on grade	$22.50 —		$23.50
Actual prices received by U. S. producers approximate the Mexican export prices.			
Talc, f.o.b. works, ton:			
New York, purified	$18.00 —		$20.00
Vermont, extra fine			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Some restricted sales at $11.50; (b) Corrected; (c) Nominal.

IRON AND STEEL

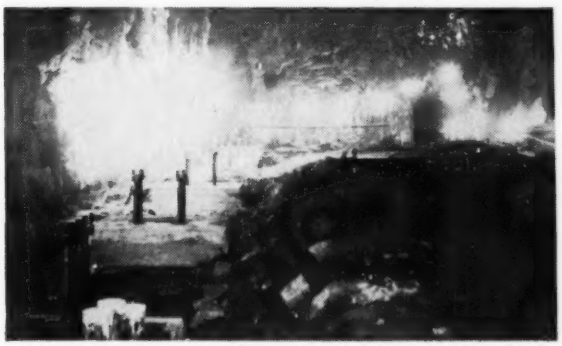
Pig iron, gross ton, basic, Valley furnaces		$66.00
Steel, f.o.b. Pittsburgh, billets, net ton		$80.00
Structural shapes, Pa., Ala., etc., 100 lb	$5.30 —	$5.50

"SAGE" Project, Computer Center for Canada's Bomarc Missile Defense, Built with Eimco Equipment



"Only satisfactory equipment to do job" says George R. Stunden, Contract Manager, Atlas-Robertson.

North Bay, Ontario, Canada—Canada's SAGE computer center is entirely underground and is considered to give the best possible protection of any installation of this type in the world. The main chambers are an excavated 200,000 cu. yd. hole with an additional 100,000 cu. yds. of tunnels, etc. also in solid rock, one of this continent's largest underground caverns and the first tunneled, rather than cut and cover, SAGE installation. A free-standing, steel frame building will be erected within this man-made cavern.



Access to the main chambers is by two adits, both driven at - 10% gradient. The south main adit was a 16 by 17 foot heading, over half a mile long. Two Eimco 105 Tractor-Excavators were used here to high-ball the heading, so that the main chamber could be started as quickly as possible, working around the clock and loading directly into trucks. Says John H. Douglas, Resident Engineer: "At the start of the job, there was some concern about the Eimco 105 Excavators' ability to load on these grades and further, whether or not they could properly load trucks. However, no trouble was encountered and the Eimco 105's worked extremely well and the trucks were loaded full".

The north adit, well over a mile long, was a 12 by 13 foot heading again driven at a -10% gradient. Here, two Eimco 630 air-powered Excavators were used to load into a monorail mounted conveyor loader which, in turn discharged into 6 cu. yd. cars. A train consisted of five cars and hoisting was done with a six foot diameter mine hoist. By the time this adit had been driven 4,200 feet, the economical limit of the hoist had been reached and so the heading was completed up-grade by the Eimco 105 Excavators. A third Eimco 105 Excavator was introduced at this point, because additional work was being done in the chambers at the same time.

Patrick Harrison & Company did the 6 by 7 foot tunnel work and raising on a sub-contract, using an Eimco 21 RockerShovel Loader.

Consulting Engineers were A. D. Margison & Associates of Toronto, with John H. Douglas as Resident Engineer. General Contractors were Atlas-Robertson (Joint Venture) with headquarters at Montreal. George R. Stunden was contract manager, Glen West, Superintendent; John E. Cain, master mechanic; H. J. (Dick) Dawson, project engineer.

All the tunnel work and some of the chamber excavation on the SAGE project was done with three Eimco 105 Diesel Powered Excavator-Loaders; Two Eimco 630 Air-Powered Excavator-Loaders and one Eimco 21 RockerShovel Loader.

Atlas-Robertson were serviced by Mine Equipment Company, Dealer in Canada for The Eimco Corporation, direct from their North Bay warehouse, only a few miles from the job site.

For further details and specifications on dependable Eimco equipment, contact the dealer or branch nearest you, or write The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah, U.S.A. for "Tunneling Bulletins."

EIMCO

"Advanced Engineering and Quality Craftsmanship Since 1884"

B-767

Plants grow better beside water

That's because an abundance of water is necessary for plant life. And those that have their roots at the water's edge can devote full attention to the problems of productivity.

Since 1953, more than 3,000 new plants have located on the Mississippi River System alone, not to mention the Great Lakes, the Gulf and numerous other rivers. Why? Mostly it is a matter of the "cost of living." Process water and plant utilities can be obtained economically; raw materials and finished products can be moved in and out at low cost.

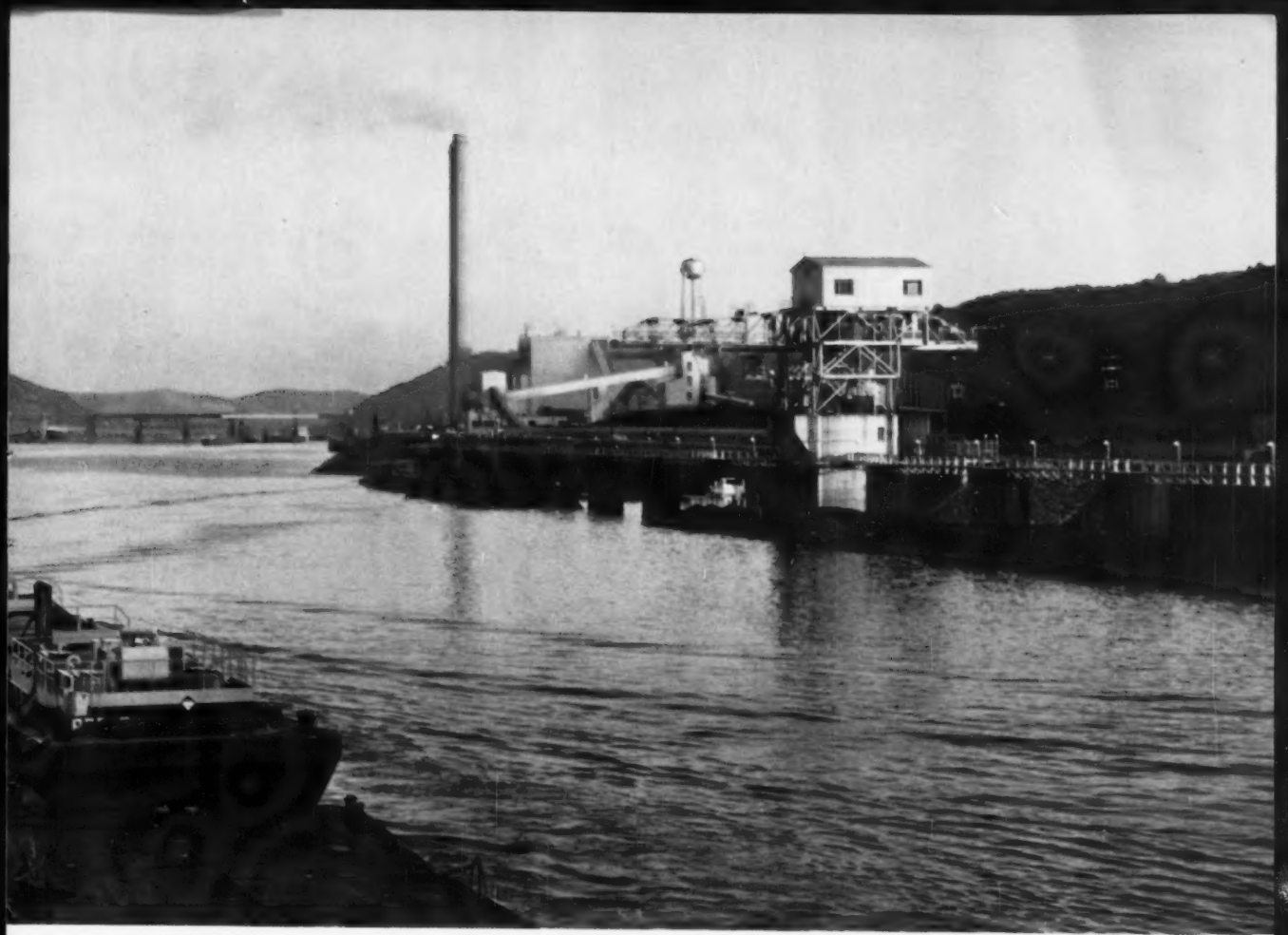
If you are considering a waterside location, or plan to expand or modernize an existing plant, you are invited to call on Dravo's 60 years' experience in and around water. Work has been performed for the U.S. Army Corps of Engineers in every one of the past 60 years, including many lock and dam projects in the continuing program for improvement of the country's inland waterways system. Another activity is production and marketing of river sand and gravel. Hundreds of industrial plants are served by Dravo-built docks. Ships and barges laden with ore, coal, bauxite and other bulk cargo are unloaded by Dravo materials handling equipment.

Pumphouses and water intakes, water and waste treatment facilities, steam or power generating plants, fabricated piping are also company specialties. Towboats, tugboats and barges launched at the Pittsburgh or Wilmington shipyards move almost every type of water-borne commodity. A subsidiary, Union Barge Line, offers common-carrier and contract transportation service on the Mississippi River System and Gulf Intracoastal Waterway.

The coupon can be used to obtain more information on these activities.

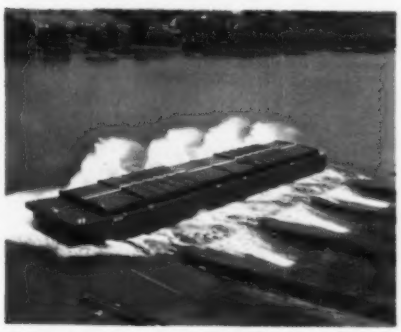
Marine construction experience includes giant dam and lock projects—commercial installations of all kinds.

Twin high-speed river towboats built for a New Orleans transportation company.



A Union Barge Line tow carries products of many industries.

Generating station, dock and unloader built on turn-key basis.



A covered hopper barge is launched at Neville Island shipyard.

Dravo Corporation, 4790 Grand Avenue, Pittsburgh 25, Pa.

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☐ Pumping Stations & Intakes ☐ Oxygen Steelmaking ☐ Steam & Power Plants
☐ Sewage & Water Treatment ☐ Ore Bridges ☐ Towboats & Barges
☐ Coal & Ore Unloaders ☐ Shafts, Slopes ☐ Fabricated Piping
☐ River Transportation ☐ Grating ☐ Container Cranes
☐ Sintering & Pelletizing Plants ☐ Space Heaters ☐ Compressor Stations
☐ Docks, Harbors, Foundations ☐ Oxygen Plants ☐ Process Machinery

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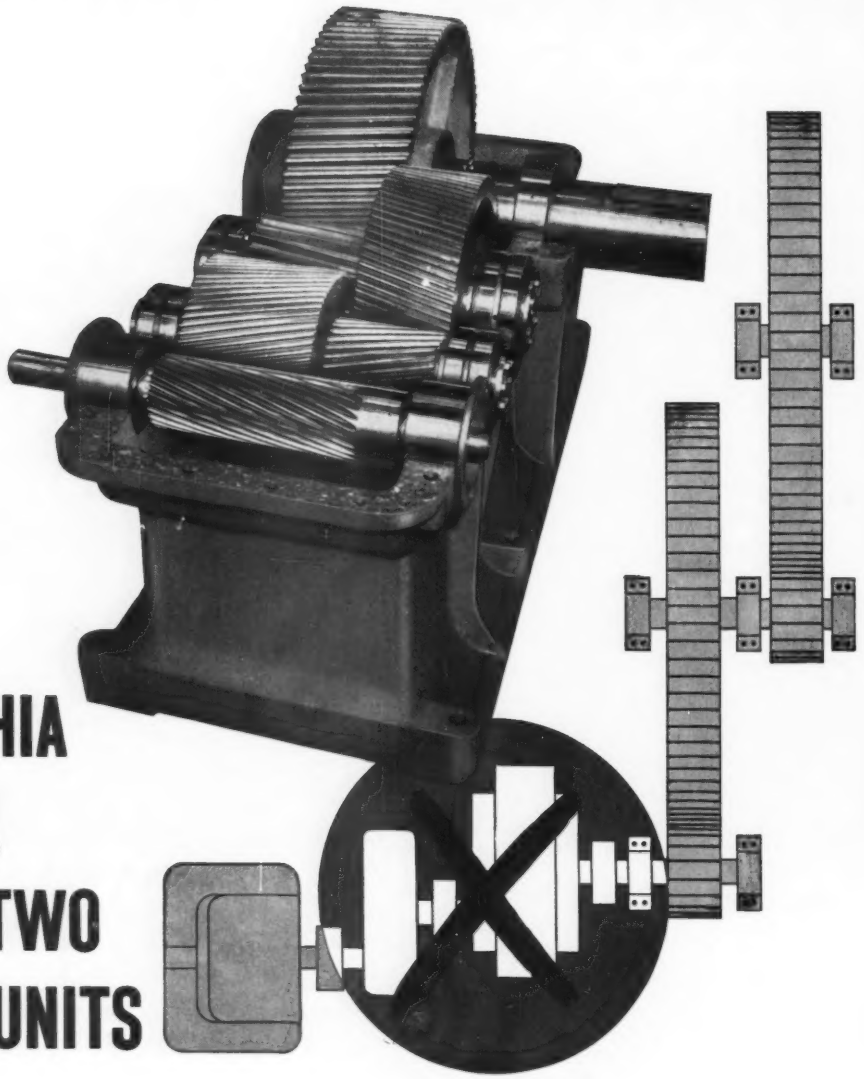
DRAVO

ONE PHILADELPHIA MILL DRIVE REPLACES TWO STANDARD UNITS



This 1250 HP Philadelphia Precision Ground Helical Gear Drive takes the place of separate high speed and intermediate speed reduction units. Radically improved gear accuracies reduce dynamic load factors . . . gearing has increased load carrying capacity. Result: you can save space, increase speeds, transmit more power and get longer gear life.

Philadelphia precision ground gearing for high-speed, heavy-duty applications like this is the most important advance in power transmission in the last decade. So advanced in fact, that conventional standards of gear accuracy are suddenly out of date. It is a major breakthrough that can solve drive problems that could never be solved before . . . because you get engineering advantages that were never available before.

To learn more about the advantages of Philadelphia precision ground gearing, and how it is revolutionizing large mill drives, write for catalog No. GH-59.

philadelphia gear drives

PHILADELPHIA GEAR CORPORATION

King of Prussia (Suburban Philadelphia), Pennsylvania

Special report to users of Caterpillar D7, D8 and D9 Tractors:

CAT CATERPILLAR

Parts you can trust
...cost less per hour

New Piston and Ring Combination Cuts Oil Consumption 33-50% ...Lasts Hundreds of Hours Longer!

What makes it so different? Look at the two Caterpillar-made pistons. Notice in the new design that *both* compression rings are now deeply seated in grooved cast iron (indicated in yellow) instead of only the top ring. Since cast iron is able to resist groove "pound out," both compression rings are held firmly *longer* in the correct position for maximum ring-to-liner sealing. Compression loss and blow-by *behind* rings and around grooves is delayed hundreds of hours, too.

The new intermediate compression ring is a "twist" ring, so-called because it changes position in the groove during the power stroke. It actually "twists" so its face has *greater sealing area* at the liner than regular rings—reducing the number of compression rings normally required. At the same time, it thins the film of oil left by the regular oil control ring. This leaves less oil to burn away which contributes to the new piston's better oil control and longer ring life.

All rings now have a new look, too . . . *each and every* face is thickly chrome plated against wear. They are also "bright lapped" to such brilliance that any flaws can be easily seen and the faulty ring rejected. Such quality control assures almost perfect seating right from the start, eliminating break-in blow-by, slobbering and scuffing.

Cost? Pistons with the *extra* cast iron bands cost *slightly more*, but ring sets are less! Once you change over, your tractor maintains its power longer, your fuel and oil bills go down, and your next set of replacement rings will be less. Your Caterpillar Dealer has them in stock now.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

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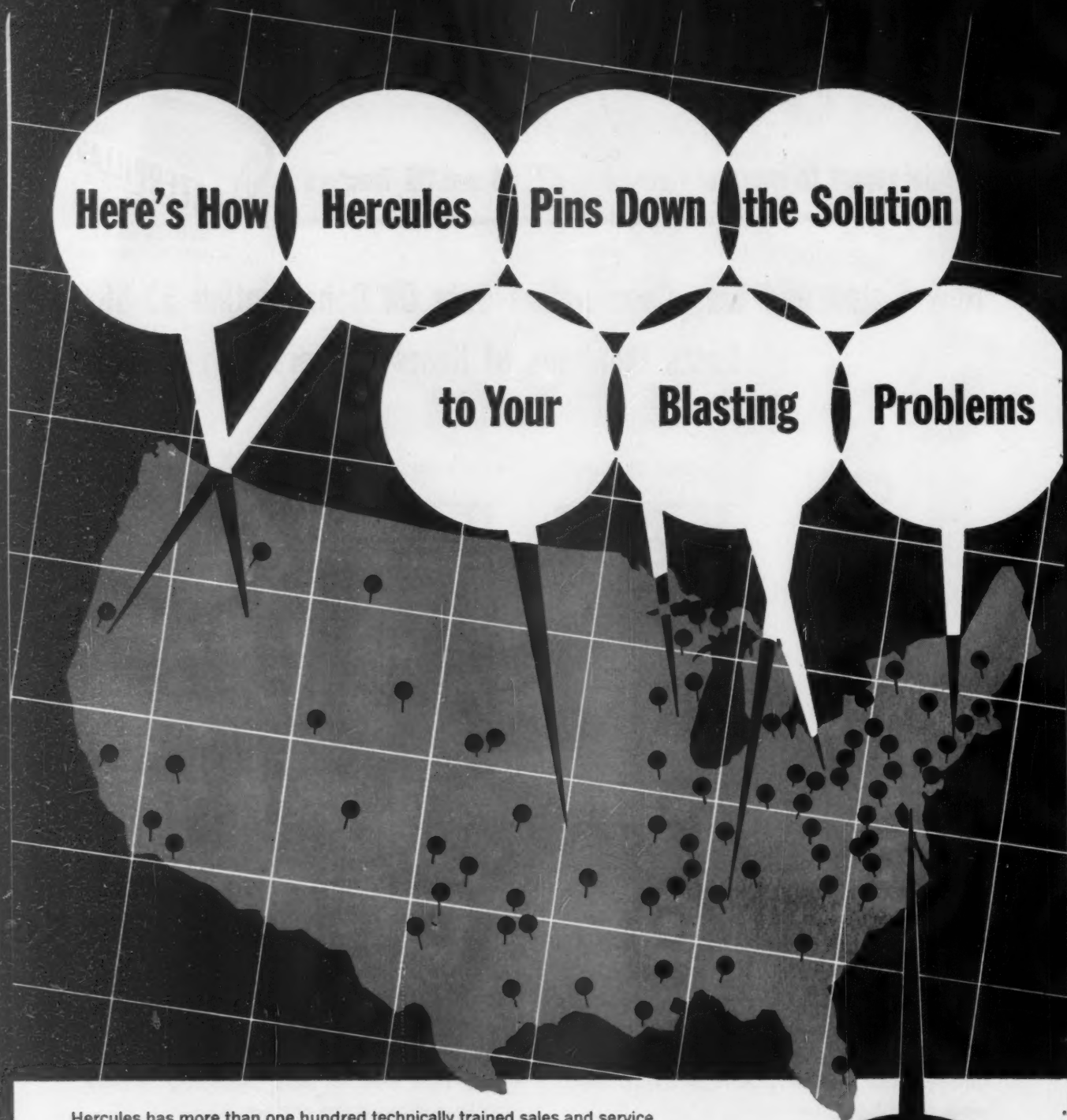
Diesel Engines • Tractors • Motor Graders • Earthmoving Equipment



Hercules has more than one hundred technically trained sales and service representatives strategically located throughout all major explosives-consuming areas. These Hercules men are ever ready to place their specialized talents at your service in helping to solve your blasting problems.

Whatever your blasting needs are, there is a Hercules® Explosive to do the work efficiently and economically. From specialized explosives for a specific use to the latest development in blasting agents, Hercules is able to meet your requirements quickly.

Explosives-manufacturing plants and distribution centers, adequately stocked with the major grades of explosives, are maintained in all mining and quarrying areas. Large quantities of standard grades and sizes, and a full line of blasting accessories are available for immediate delivery. Let our representative tell you how Hercules technical skill combined with Hercules Explosives can save you money.

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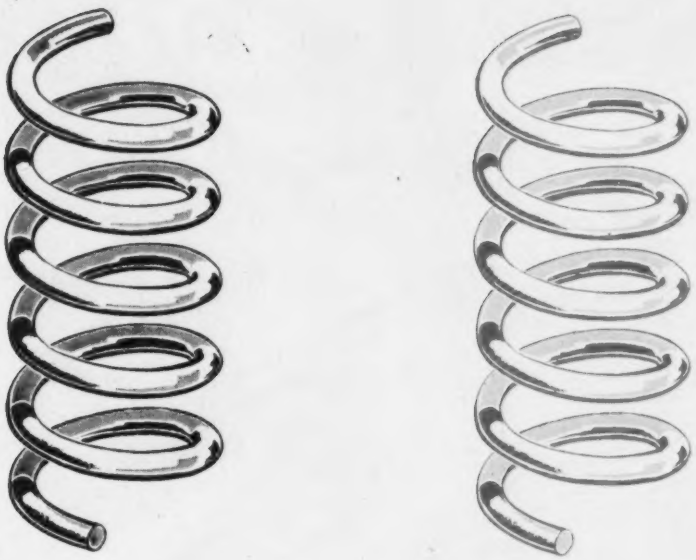

Why hard and soft SPI-RAL rods?

Suppose you want a rod with the extra hardness, wear-resistance and long life of tough carburized alloy steel, and don't want to consider reconditioning; then the Ingersoll-Rand 1¼" hex SPI-RAL rod is for you.

On the other hand if you want the extra economy of a rod that can be reconditioned good-as-new, and used over and over again, then you want the non-carburized Ingersoll-Rand 1½" round SPI-RAL rods. They are made of a special grade alloy steel, pretreated to make it the hardest workable steel available.

Ask your Ingersoll-Rand man about these two fast-lead rods for your CRAWL-IR jobs today.

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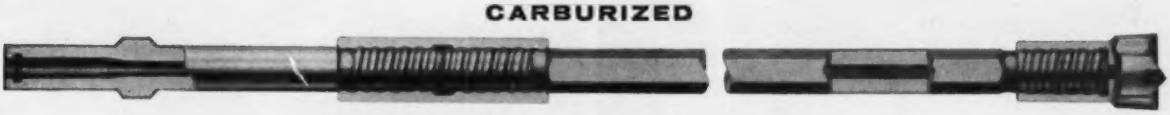

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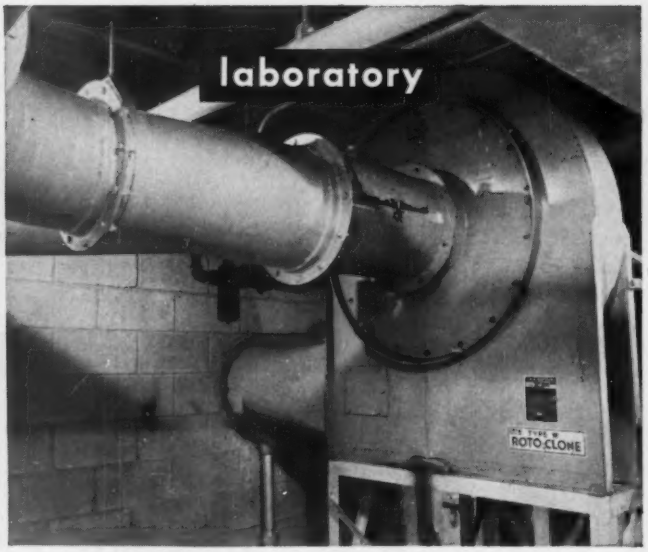
Ingersoll-Rand

226A5 11 Broadway, New York 4, N. Y.

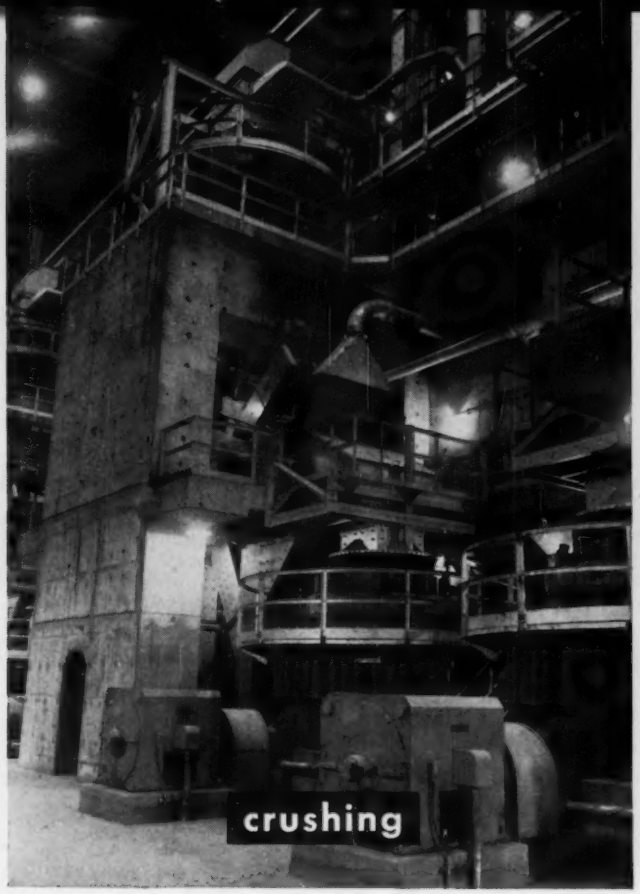
A CONSTANT STANDARD OF QUALITY IN EVERYTHING YOU NEED FOR DRILLING ROCK

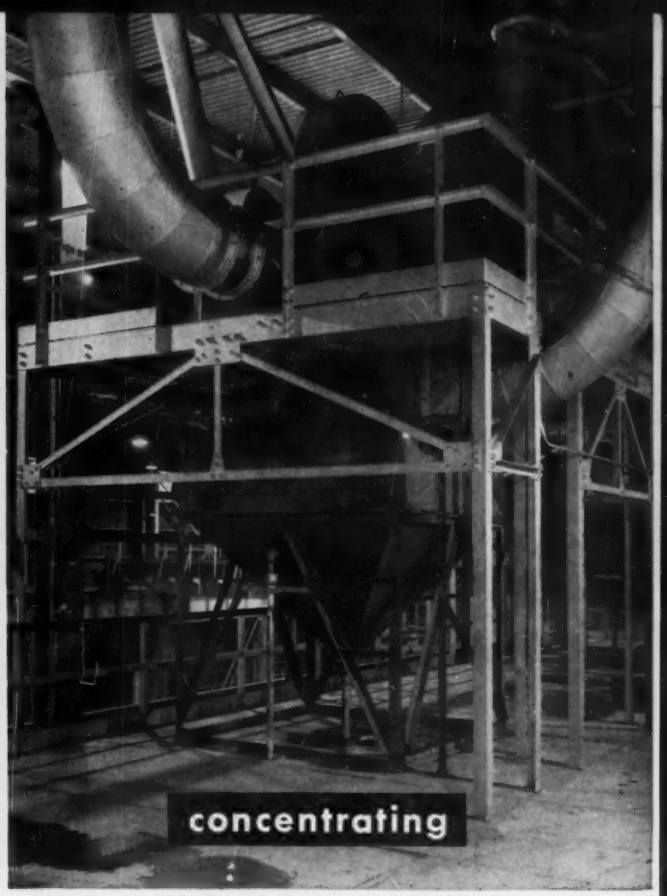
AAF dust control "rides herd"

AAF Type N ROTO-CLONE exhausting bottom discharge of pelletizing furnace. It's one of 35 Type N's at this installation exhausting pelletizing furnaces, coal dryer and transfer points.



Type W ROTO-CLONE exhausting dust-producing operations in laboratory. It's one of 30 Type W units at this plant. Others exhaust crushing, screening, transfer and bin ventilation operations.





on tough taconite ore!

All operations dust-proofed by 65 AAF ROTO-CLONES (1,100,000 cfm!)

Dust never shows its face in this modern taconite processing plant. From the first transfer point, through crushing, concentrating and pelletizing, it's under the complete control of two types of rugged AAF ROTO-CLONES—the Type W and Type N.

These collectors have been dust-proofing taconite since 1947, and are now used by *all* major processors. The Type W combines the principle of dynamic precipitation with dust-trapping water sprays. The Type N combines centrifugal force with the thorough intermixing of water and dust-laden air. *Both* offer (1) small space requirements, (2) maintained performance, (3) constant exhaust volume, and (4) high collection efficiency.

For more information on these wet-collecting ROTO-CLONES, call your nearest AAF representative or write for Type W Bulletin 274 and Type N Bulletin 277. Address: Mr. Robert Moore, American Air Filter Company, Inc., 193 Central Ave., Louisville, Kentucky.

AAF American Air Filter

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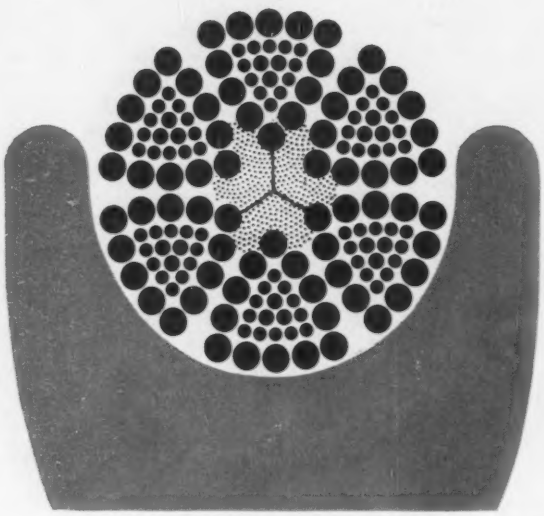
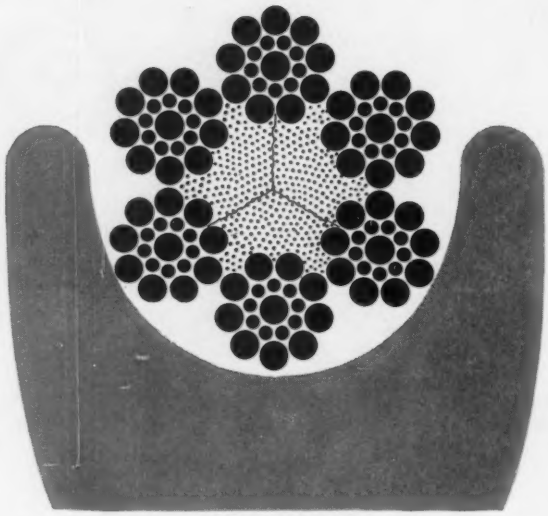
Get longer rope life in shaft hoists with Bethlehem Flattened Strand



BETHLEHEM FLATTENED STRAND



ORDINARY ROPE

. . . it has 100 per cent more wearing surface than rope made with round strand

Bethlehem Flattened Strand resists abrasive wear and crushing more effectively than ordinary rope because more than half of the outer surface of the triangular-shaped strand makes contact with wearing points such as sheaves, drums, and spooled rope. Abrasive wear is distributed over a wider area of the rope surface than when a round strand rope is used. In fact, the wearing surface of Bethlehem Flattened Strand is 100 pct greater than that of ordinary rope.

Another economy feature of Bethlehem Flattened Strand: its smooth surface helps to minimize wear on drums and sheaves. It is furnished in 6 x 27 type H, lang lay, Form-Set construction.

For complete information get in touch with your Bethlehem wire rope distributor. Or write us at Bethlehem, Pa.

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Export Sales: Bethlehem Steel Export Corporation

There's a distributor of Bethlehem Rope near you, supplied by our nationwide network of wire rope mill depots.

Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL

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You'll be getting a machine that can bulldoze, do "carry-type scraper" and grader work—and can give you power-shovel-like, pry-over-shoe break-out force for tough digging. This TD-9 Four-in-One is punching a hole into a West Virginia hill—for punch mining a 5' to 7' coal seam. Note that the operator gets full-sized, full-capacity, depth-controlled bulldozer action!

Only 4-in-1's take over for a whole "equipment spread"

Figure the thousands of dollars ahead you'll be by letting one International Drott Four-in-One take over for several specialized rigs. *One machine (with uses unlimited)—one investment—one operator.* That's streamlining for profit!

Dial your International Drott Distributor for a demonstration of a Four-in-One today!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

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DROTT®

You'll profit from positive clamshell bottom dumping—to handle all types of materials, in all kinds of conditions, even where obsolete buckets fizzle out. This fast-working TD-15 Four-in-One is saving an hour a day in bucket clean-out time, loading sticky clay. Opening the Four-in-One's clam pulls material from bucket surfaces; gravity down-pull assures prompt self-cleanout!

You'll clam-on to anything you want to move and handle it fast! This TD-9 Four-in-One clam-handling a tree does all the land-clearing and load-out work at a pit producing bank gravel. This "bucket with the bite" easily grabs, carries, and loads stumps, boulders, and other "impossibles"—with the "man in the seat" in full charge!

How planet-drive "25"

stripping . . . ripping .

To make full-load turns, you simply change the speed of either TD-25 track with "live-track" Planet Power-steering. This way, you keep full power and traction on both tracks, *full time.* You get rid of load-limiting, profit-squeezing "dead-track drag."

To handle big offset loads, or to counteract the side draft of benching or highwalling, without sluing or bank-nosing, is finger-tip easy. Just shift the TD-25's load-side track to high range; leave the other track in low. You stay on course, deliver full loads or make full cuts under full power.

To keep full loads on the move, full time through tough or easy going, use instant-acting, on-the-go Hi-Lo power-shifting. Pit-to-hopper matching of power to condition helps "keep the heap"—extends effective dozing distances—cuts down on payload spillage. Fast, easy TD-25 power-shifting is a built-in bonus of Planet Power-steering!

And only the International TD-25 gives you the 230 hp wallop of the free-breathing, dual-valved DT-817 diesel—with peak turbocharging efficiency at all altitudes.

Prove the profit advantage of full-load delivery, full time. See how consistently the TD-25 outproduces king-sized clutch-steered competitive rigs. Compare operating and upkeep economy, too. Let your International Construction Equipment Distributor demonstrate.

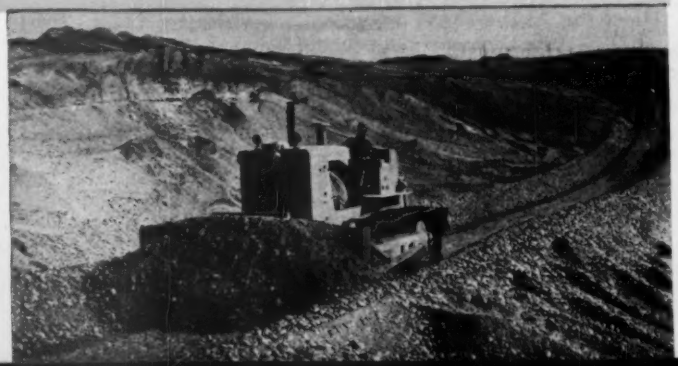
International® Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

"Our International TD-25 doubles load delivery of regular 'dozer blade . . . using V-type blade on spoil leveling," reports Partner Carl Sartori, Willowbrook Mining Co., Slippery Rock, Pa. On-course steering with this heavy offset load is achieved by upshifting speed of load-side track—to put extra power leverage where needed.

Doubling for dynamite—this TD-25 rips and breaks up a 30-inch vein of coal—to reduce cost of loading out with a 3-cu yd power shovel for Rice Brothers Coal Company, Phillipsburg, Pa. Power-on-both-tracks steering means "full speed ahead" with the ripper. The two TD-25's on this job team up with three draglines to move 25% of a 60-foot-deep overburden.

Pushes of over 600 feet pay off for Contractor C. R. Davis, Albuquerque, New Mexico—producing road gravel. Instant speed control of either or both tracks with the planetary transmission means positive load control—to heap the blade and "run" to the crusher. Then the "25's" high reverse of 7.5 mph means fast back-up for the next push. What would have been a costly two-tractor operation is efficiently done with one TD-25!



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COUNT ON FIRESTONE TO SEE YOU THROUGH!

Mount Firestone Super Rock Grip Deep Tread tires on your hard-pushing quarry trucks—and watch downtime take a licking. The only tread design of its kind, this tire's 50% deeper tread is made of Firestone Rubber-X, tough enough to fight off cuts and bruises in the ruggedest off-highway going. And, because this tough tread extends through to the cord, you get a wearing-base bonus in recaps.

Its Shock-Fortified nylon cord body, too, staves off schedule-disrupting impact breaks. For on-the-job service and quarry tires at their best . . . naturally, you'll see your Firestone Dealer or Store.

Firestone

Always Specify Firestone Tires When Ordering New Equipment

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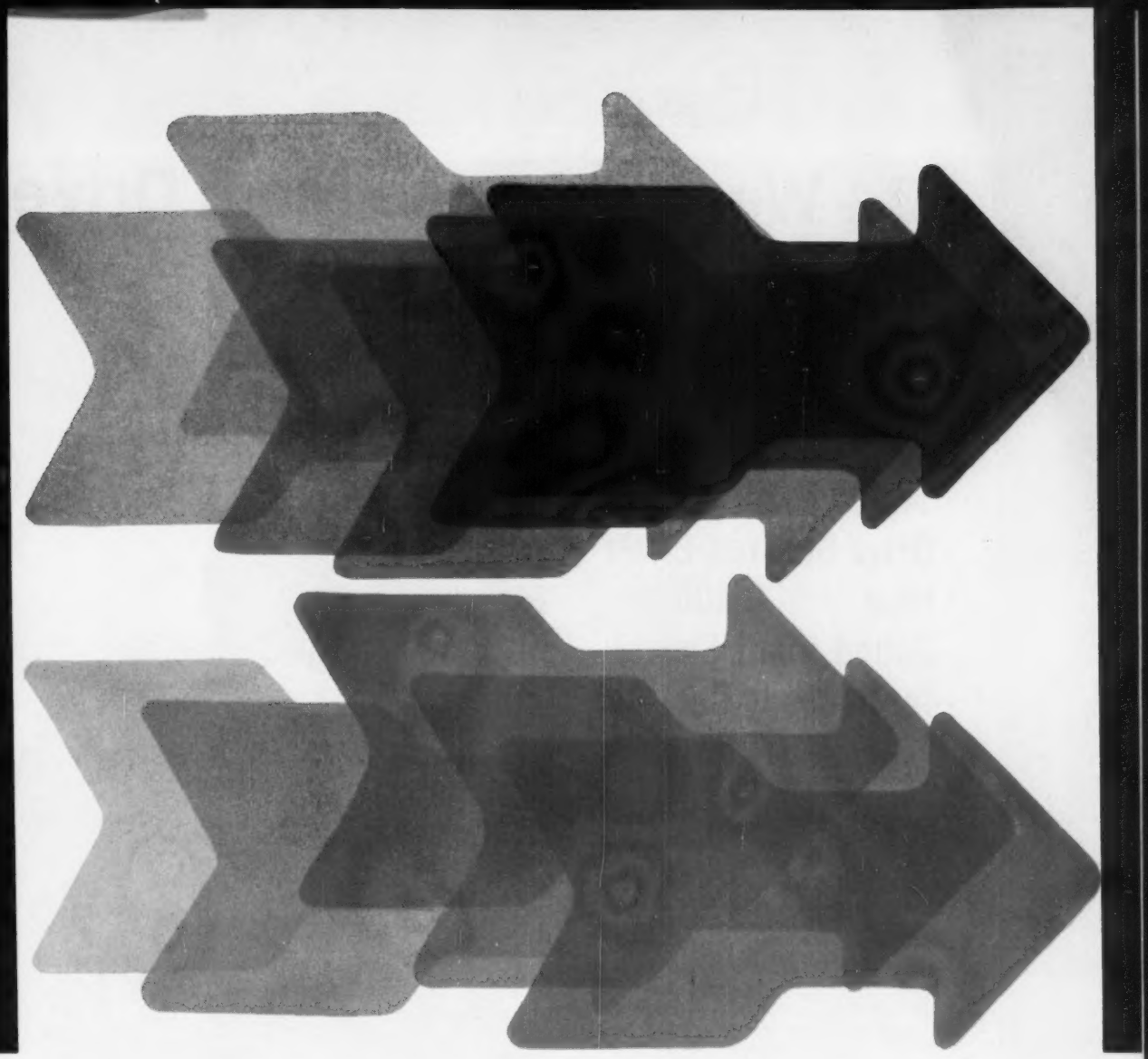

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24 Westinghouse Main Drive Motors and Control to Power Largest Mobile Land Machine Ever Built

14,500 Horsepower to Drive Bucyrus-Erie's New 14,000,000-Pound Giant Shovel for Peabody Coal Co.

Westinghouse electrical equipment —powerful, fast and reliable—will drive this huge shovel. For digging there will be eight 625-hp d-c hoist motors, six 500-hp d-c swing motors, and two 500-hp d-c crowd motors. A separate d-c generator will power each motor. The generators will be assembled into four M-G sets, each driven by a 3000-hp synchronous motor. Eight 250-hp a-c motors will power the crawler propel drives. Dozens of smaller motors will power various auxiliary drives.

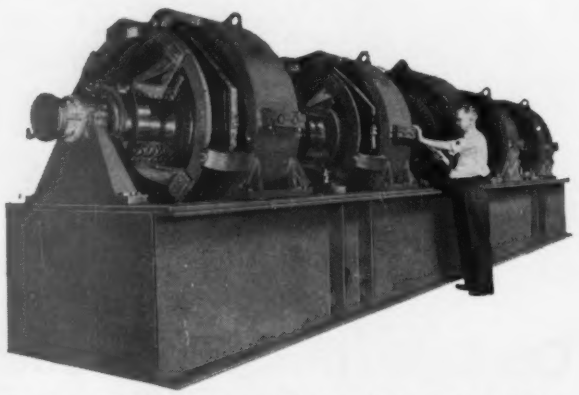
Modern Magamp-exciter control provides smooth performance and fast response of the main d-c drives with minimum current overshoot. Flexible and easily adjustable, this control permits selection of optimum motor performance characteristics needed for any particular digging condition.

With Westinghouse Magamp-exciter control for the hoist, swing and crowd, the huge machine will have a 50-second digging cycle. Loaded dipper speeds during swing will reach 25 miles an hour; the boom will accelerate to top speed in eight seconds and decelerate to zero speed in four seconds. Westinghouse drives will be built to maintain this demanding performance continuously, withstand extreme vibration and still develop over 200% of rated loading whenever required.

You can be sure...if it's Westinghouse

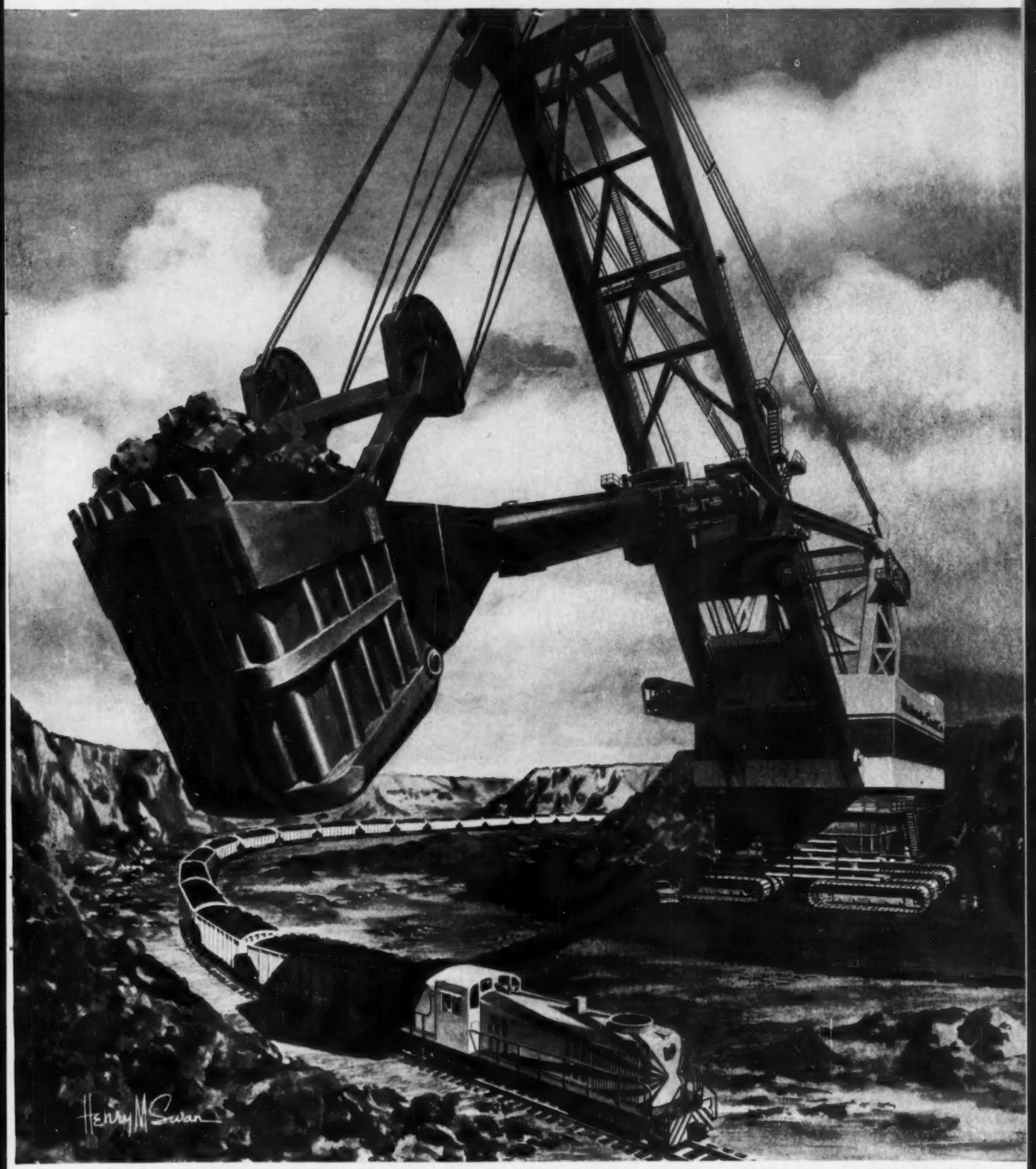
J-96159

Main drive d-c motors and M-G sets have exclusive Westinghouse Thermalastic® insulation, exceedingly stable and resilient, to withstand electrical thermal shock variations encountered in shovel service. Tough, low-inertia d-c motor armatures make possible very fast starts, stops and reversals.



World's largest shovel motor-generator sets have these design features—Heavy-duty, self-aligning, spherical seat pedestal sleeve-type main bearings and double-ball end thrust bearings —permitting operation at as much as 10° tilt. Extremely heavy and rigid self-supporting bedplate—insuring that rotating units will stay in correct alignment even under heavy shock stresses and vibration transmitted from shovel structure.

Westinghouse



New Bucyrus-Erie electrically driven strip mining shovel for Peabody Coal Company will weigh 7000 tons, more than Juneau Class Navy cruiser . . . will tower 213 feet high with 450 feet working range. Mammoth 115-cu-yd dipper is 64% larger than any built to date . . . will move over 200,000 tons of overburden per day, making possible mining of 4,000,000 tons of coal per year.

THREE NEW FEED LEG DRILLS

WITH DRIFTER DRILLING SPEED

The drilling speed of a drifter . . . combined with the greatest handle-ability ever built into feed leg drills . . . bring top drilling performance to your underground workings. Put one to work in your own mine, and compare these outstanding Gardner-Denver advantages:

Fast-acting, drifter-type valve
Centralized, one-hand controls
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Seven travel lengths from 2′ to 5½′
Adaptable for use as a drifter or stoper, or on sinker drill applications.

See your Gardner-Denver Rock Drill Specialist . . . or write for details on the complete line of Gardner-Denver Air Feed Leg Drills.

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is running this locomotive

There is no one in the locomotive. The man in the picture can speed up, slow down, stop or reverse this train, *whether he is riding the locomotive or walking, or standing on the ground.* Both he and the locomotive are equipped with a new Union Switch & Signal remote control system for industrial switching locomotives. Because the operator always can be at the best vantage point, blind operations are eliminated and cars are spotted for loading, unloading or dumping more efficiently. This man can put a car *precisely* where he wants it.

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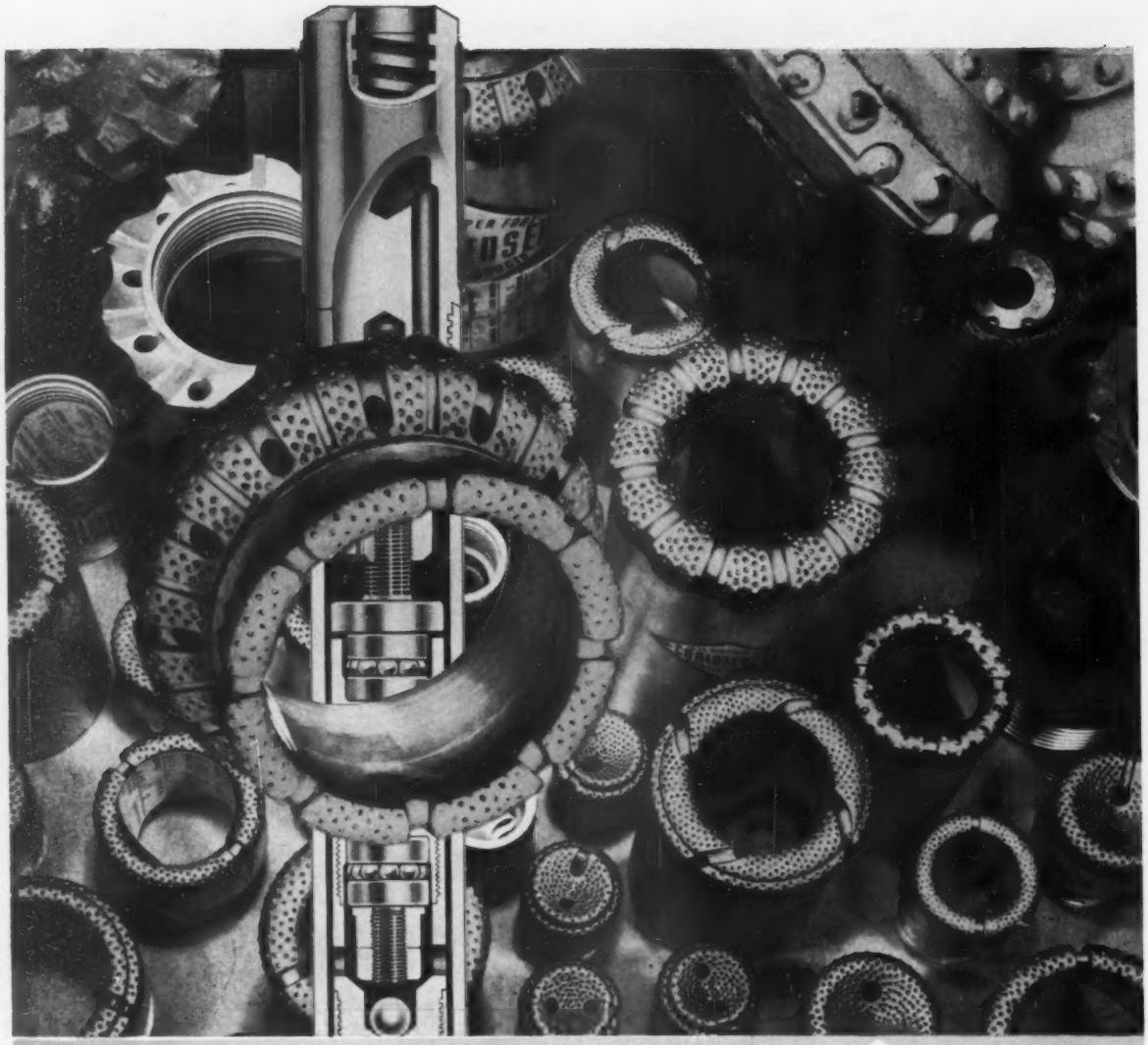

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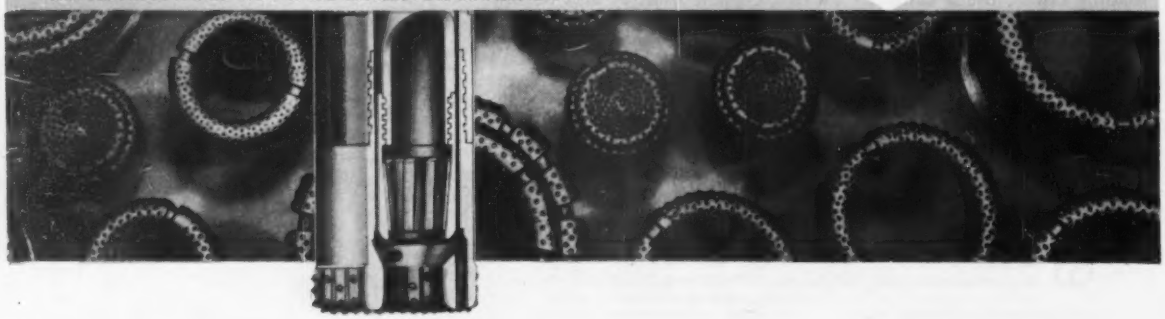


TODAY'S PATENTS

Tomorrow's technology

OLIVER S. NORTH

U. S. PATENTS

Metal and Mineral Processing

Separation of columbium from tantalum. A mixture of chlorides of those metals is admixed with an anhydrous methanolic solution of 8-hydroxyquinoline. Columbium values selectively precipitated by the addition of a nitrogen-containing base. W. Scheller, assigned to Ciba Ltd. U.S. 2,998,298.

Recovery of values from refractory ores of beryllium, tungsten, rare earths, columbium, tantalum, etc. The ore is admixed with sodium nitrate or like compound and powdered coal or other fuel, and the mixture heated to form Na_2CO_3, and then heated to a higher temperature to produce an insoluble carbonate of the metal and a soluble alkali compound. The reaction mixture is leached, and the residue recovered and treated for its metal content. A. R. Ronzio, assigned to Radiological Research Institute, Inc. U.S. 2,999,747.

To prevent fusion and sticking of iron ore pellets during induration thereof in a shaft furnace, a CO-containing gas is ignited in the central portion of the shaft only, so that any fusion of pellets will occur well away from the shaft lining. T. Basen, assigned to Elektrokemisk A/S. U.S. 2,999,748.

A multi-channel, gravity type apparatus for recovering and separating mineral values from beach sands and like ores. The apparatus has high throughput capacity and can be operated for long periods of time without making multiple adjustments thereto. E. A. Hobart, assigned to Hobart Bros. Co. U.S. 3,000,502.

Recovery of uranium from uraniferous lignites of the Black Hills and similar fossil fuels. The ore is reacted with oxygen at a temperature above 2000°F to drive off CO, and residual solid is recovered and extracted with an aqueous solution of Na_2CO_3, H_2SO_4, or other reagent capable of forming a water-soluble salt of uranium. C. F. Teichmann, assigned to Texaco Development Corp. U.S. 3,000,696.

CANADIAN PATENTS

Metal and Mineral Processing

A method for recovering a high percentage of the values and obtaining a high-grade coarse sylvite product. Ground sylvinite ore is subjected to a froth flotation procedure and then to a sizing step. A. Adams and W. B. Dancy, assigned to International Minerals & Chemical Corp., Aug. 15, 1961. Canadian 625,807.

A method for preventing sticking to the stirring arms of low-melting eutectic mixtures formed during roasting of pyrites to obtain SO_2 gas and an iron oxide residue. The ore is fluidized and roasted at high speed and high temperature, but the temperature is maintained below the fusion point of the roasted iron particles. A refractory-lined vessel is used, and stirring arms and other moving mechanical parts are not required. A. Johannsen, H. Wolf, W. Danz and W. Pflannmueller. Aug. 22, 1961. Canadian 625,857.

E&MJ Monitor

Improved system for blending and mixing iron ores or other ore concentrates to be agglomerated with return fines, pulverized fuel, etc., and feeding the mixed material onto the sintering machine pallets to form a deep bed of uniform permeability for updraft or downdraft sintering operations. R. C. McDowell and T. E. Ban, assigned to McDowell Co., Inc. Sept. 12, 1961. Canadian 627,363.

System for grinding, classifying and magnetically concentrating low-grade magnetite, ilmenite, franklinite, and other magnetic ores to economically recover a premium concentrate containing 60% or better of iron content. P. E. Cavanagh and C. W. Hedberg, assigned to Ontario Research Foundation and Research-Cottrell, Inc. Sept. 12, 1961. Canadian 627,428.

BRITISH PATENTS

Mining

In the lining of mine shafts with two steel cylinders having an intermediate shell of concrete, the cylinders are provided with lengths of T-section or I-section iron embedded in the concrete. Stresses on the inner and outer cylinders are relieved. Assigned to Gutehoffnungshutte Sterkrade A.G. Aug. 23, 1961. British 875,804.

To prevent undesirable comminution from a long free fall when backfilling mine shafts or other workings with waste rock, the feed chute is provided at both ends with means for preventing escape of air therefrom, so that the falling material is cushioned by the air trapped in the chute. Assigned to Gewerkschaft Reuss. Aug. 30, 1961. British 876,148.

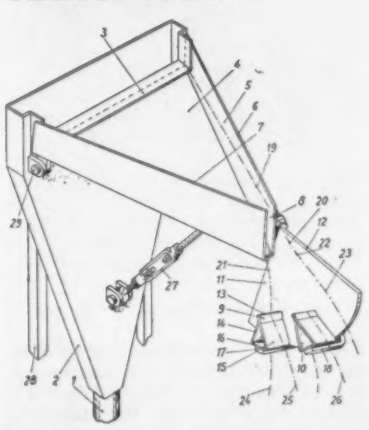
Metal and Mineral Processing

Method and system for combining and mixing iron ore fines, recycled fines, pulverized coal, and other materials and for delivering and distributing the material onto sintering machine pallets to form a deep bed of uniformly permeable material for updraft or downdraft sintering. The system can be used also in the sintering of lead-zinc ores and other ores and concentrates. R. C. McDowell and T. E. Ban, assigned to McDowell Co, Inc. Aug. 30, 1961. British 876,189.

Agglomeration of iron, nickel-cobalt, or other ore concentrates or fines. The ore is admixed with an optimum amount of an asphaltic bitumen emulsion of specified properties, and the agglomerates ignited to burn the binder by autogenous combustion under conditions resulting in a partial fusion of the ore to form a porous slag. Assigned to Shell Internationale Research Maatschappij N.V. Aug. 10, 1961. British 874,785.

Separation and recovery of metal values from aqueous liquid solutions, such as nickel-cobalt-copper ore leach solutions. The solution is contacted with a solid chelate exchange resin that is insoluble but swellable in the solution. Cited examples show good separation of nickel, cobalt and copper. Cobalt is selectively retained first, and then nickel and copper in that order. R. A. Mock, R. C. Calkins and C. A. Marshall, assigned to Dow Chemical Co. Aug. 30, 1961. British 876,014.

GERMAN PATENT



Pinched-sluice gravity concentrator. As illustrated above, the pulp to be treated is pumped through pipe (1) into a chamber (2) above, and overflows via weir (3) into sluice (4), the sidewalls of which (6, 7) terminate into a narrow, slot-like opening (8). The pulp leaving the sluice falls upon a plate (12) facing it at an angle of 20 deg. Splitters (9 and 10) part the pulp discharged onto the plate (12) into concentrate (24), middling (25) and tailing (26). Patent DAS 1,097,921 issued to Carpco. Reported in August 1961 issue of ERZMETALL.

Mr. North is patent consultant, Washington, D.C.

NEW BOOKS

Keeping up with your profession

Metallurgy of the Non-Ferrous Metals, second edition, by W. H. Dennis. This modern text treats extractive metallurgy by division according to metal and importance according to the value of each industry. Thus, the section on copper not only occurs first but is also weighted heaviest. However, many of the newer important metals are given added emphasis in the second edition. For example, there is one complete chapter on titanium. In line with this, processing techniques have been extensively up-dated.

Prof. Dennis covers the sources of the metals, the operations concerned in their extraction and the refining of the crude metal. With major metals, properties, alloys and uses are also covered. In most cases, obsolete methods have been omitted. American practice is emphasized.

This book is a well-written text, complete enough for beginning students and clear enough for non-technical people who need a good reference book. Published by Sir Isaac Pitman & Sons Ltd, Pitman House, Parker St., Kingsway, London, W.C.2, England. 711 pp. Price 75/-net (sterling).

Prestressed Concrete Cylindrical Tanks, by L. R. Creasy. Written for the practicing engineer, this book gives methods which reduce design calculation time. Alternate types of joints are detailed. Chapters on economics and repairs are also included. Published by John Wiley & Sons Inc., 440 Park Ave. S., New York 16, N.Y. 216 pp. Price $6.75.

E&MJ Monitor

Trig, Log, Antilog, and Log of Trig Functions 6 Place Tables. This indexed, vestpocket book also contains 8 pp of formulas and 8 pp of interpolation. Published by Ottenheimer Publishers Inc., 4805 Nelson Ave., Baltimore 15, Md. 192 pp. Price $1.00.

Gesteins-und Lagerstättenbilung im Wandel der Wissenschaftlichen Anschauung, von Dr.-Ing. Walter Fischer. Dieses historische Werk gibt den Wissenschaftler eine einmalige Zusammenfassung der Entwicklung der Petrographie und Lagerstättenkunde. Der junge Fachkollege wird aber nicht nur den historischen Teil, sondern gleichfalls die fachgerechte Zusammenstellung unseres heutigen Wissenstandes schätzen, wie er es in einem anderen deutschsprachigen Werk nicht finden wird. Alle geologisch-lagerstättenkundlich Interessierten werden dieses Buch mit grohsme Interesse lesen. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart W, Johannes Strasse 3/1, Württemberg, West Germany. Preis: DM79.-80 brosch., DM84.00 geb.

Profitable Use of Excavation Equipment, by Elmer R. Drevdahl, Jr. This book has been written to be used as a standard for estimating capabilities and costs of excavation equipment. Covered are fundamentals of equipment analysis, equipment output and costs, cost accounting and depreciation methods. The book contains many tables. Available from Desert Labs. Inc., P. O. Box 4666, Tucson, Ariz. University Station. Price $10.00 plastic binding, $13.50 cloth binding.

Mining Operations in 1959, Vol. LXIX, Part 2, 1960. This book contains short operating summaries of mines in Ontario including some costs and reserves. Available from the Ontario Dept. of Mines, Toronto, Ont., Canada. 140 pp.

Books presented on this page may be obtained directly from the publisher mentioned in each case. E&MJ does not sell books.

Handbook on Quarrying, compiled by L. L. Mansfield for the Department of Mines. This handbook is designed to give the non-technical operator assistance in quarrying fundamentals. Available from the South Australian Government Exchanges Bureau, Government Printing Office, Adelaide, South Australia. 185 pp. Price 7s. 6d.

Electrochemistry of Molten and Solid Electrolytes, a collection of 21 papers by Soviet scientists translated into English. Papers cover the general theory of electircal conductivity of molten electrolytes and the behavior during electrolysis of molten salts, of anodes of different composition (titanium oxide, vanadium oxide, rare earths, and columbium). Also included are investigations of the emf of electrochemical cells operating with solid electrolytes. Published by Consultants Bureau Enterprises Inc., 227 W. 17 St., New York 11, N.Y. 110 pp. Price $17.50

Refractory Metals and Alloys, proceedings of the Detroit Technical Conference, AIME, May 25-26, 1960. Twenty-two papers, some followed by discussions, are included in the book, which is available from Interscience Publishers Inc., 250 Fifth Ave., New York 1, N.Y. Price $22.00.

Geology of the Suva Area, Viti Levu, Bulletin 4, by P. Ibbotson. Published by Geological Survey Department, Suva, Fiji. 47pp. plus maps. Price 12s./6d.

Mineral Resources of Colorado, First Sequel. prepared under the supervision of S. M. Del Rio. This book offers a concise, yet complete description of Colorado's mineral resources and industry. Available from the State of Colorado Mineral Resources Board, 204 State Office Bldg. Denver 2, Colo. 754 pp plus numerous maps, charts, graphs, statistics, etc. Price $5.00.

The following publications are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D.C.:

Mining, Milling, and Water-Control Methods, Rosiclare Fluorspar Works, Aluminum Co. of America, USBM Information Circular 8012, by Ronald W. Schaefer, William H. Harrison and Frank J. Myslinski. 52 pp.

Mining Methods and Practices, Hurricane Creek Bauxite Mine, Reynolds Mining Corp., Saline County, Ark., USBM Information Circular 8016, by Raymond G. Travis, 19 pp.

Bibliography of Investment and Operating Costs for Chemical and Petroleum Plants, January-December, 1960, USBM Information Circular 8035, by Sidney Datell, John H. Faber and Mary Jo Williams. 96 pp. Price 50¢.

Mining Methods and Costs, Regal Asbestos Mine Jaquays Mining Corp., Gila County, Ariz., USBM Information Circular 7986, by L. A. Stewart. 53 pp.

Costs of Mining Under Bolted Roof and Timbered Roof in Bituminous Coal Mines, USBM Information Circular 8024, by M. J. Ackerman and J. J. Wallace.

Magnetite and Ilmenite Resources, Iron Mountain Area, Albany County, Wyo. USBM Information Circular 8037, by V. T. Dow. 133 pp.

Distribution of Uranium in Rocks and Minerals of Mesozoic Batholiths in Western United States, USGS Bulletin 1070-C, by Esper S. Larsen, Jr. and David Gottfried. 103 pp.

A Constant-Feed Direct-Current Arc, USGS Bulletin 1084-J. by C. S. Annell and A. W. Helz. The paper describes a method for introducing samples into an arc for spectrochemical analysis. 20 pp. Price 15¢.

Geophysical Abstracts 184, January-March 1961, USGS Bulletin 1146-A, by James W. Clarke, Dorothy B. Vitaliano, Virginia S. Neuschel and others. 170 pp. Price 40¢.

Tertiary Geology and Oil-Shale Resources of the Piceance Creek Basin Between the Colorado and White Rivers, Northwestern Colorado, USGS Bulletin 1082-L, by John R. Donnell. 56 pp. plus maps.

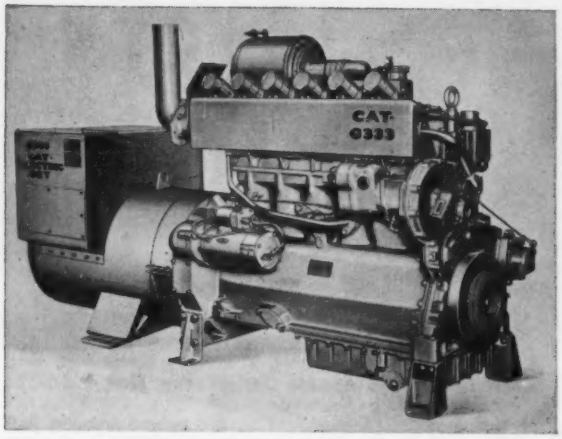
Geology of Part of the Craig C-2 Quadrangle and Adjoining Areas, Prince of Wales Island, Southeastern Alaska, USGS Bulletin 1058-H, by C. L. Sainsbury. 63 pp.

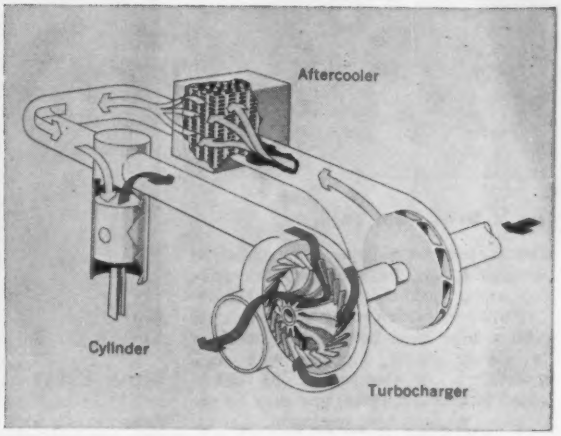
Geology of the Dubuque South Quadrangle, Iowa-Illinois, USGS Bulletin 1123-A, by C. Ervin Brown and Jesse W. Whitlow. Paper describes parts of the Upper Mississippi Valley Zinc-Lead District. 93 pp. plus maps.

(Continued on p110)

NEW EQUIPMENT

Tomorrow's tools and methods





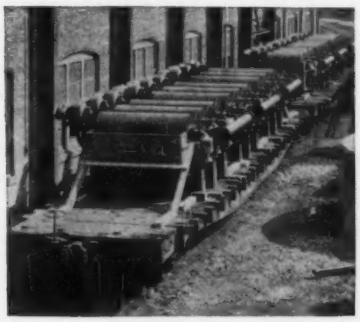
New Caterpillar Engine Combines Advantages of Diesel and Natural Gas (41)

A SIX-CYLINDER natural gas engine capable of developing 130 hp at 2000 rpm, and which takes full advantage of diesel strength standards, has been developed by Caterpillar Tractor Co.

The company said that the G333's diesel standards stem from the fact that it has a direct diesel counterpart, the D333. This, Caterpillar stated, is a primary factor in allowing up to 25,000 hours of operation before first overhaul.

It also permits taking rated power from the engine on a continuous basis, derating only for altitude and temperature.

The G333 features a low tension ignition system as standard equipment and is offered with either a 12:1 or an 8.5:1 compression ratio. The high compression ratio is specifically designed to burn processed natural gas at optimum efficiency. The low compression ratio (8.5:1) allows operation on a wide variety of gaseous fuels, including well head gas.



Huge Separator Shipment

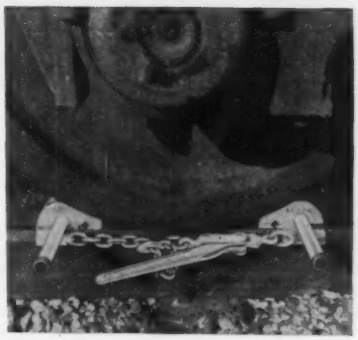
FIRST OF 108 wet magnetic separator units built by Dings Magnetic Separator Co. recently left Milwaukee for Columbia-Geneva Div.'s (USS) new $50-million taconite beneficiation facility near Lander, Wyo.

According to R. J. Haskin, Ding's general sales manager, the order is one of the largest ever placed for this type of mining equipment.

LAKE SHORE, INC. has extended its line of underground mining equipment to include low-profile, rubber-tired ore trucks and front-end loaders.

The company has agreed to participate in the development of new equipment and to act as exclusive sales and service representative for Wagner Mining Scoop, Inc., Portland, Ore.

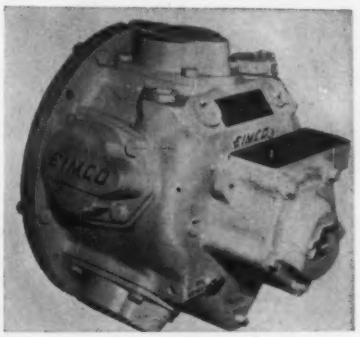
E&MJ Monitor



Safety Wheel Chock (4)

PORTABLE DOUBLE TENSION safety wheel chocks, which eliminate rail car motion during loading and unloading, are being introduced by the Aldon Co.

Aldon's double tension chock weighs 16 lb per set, is easily set in place or removed from the track under car wheels. The handled units are designed to fit any size wheel and to hold with positive no-slip grip.



New Air Motors (10)

TWO NEW AIR MOTORS, the 251 and the 271, which afford substantially increased power and valve life over existing types, have been developed by the Eimco Corp.

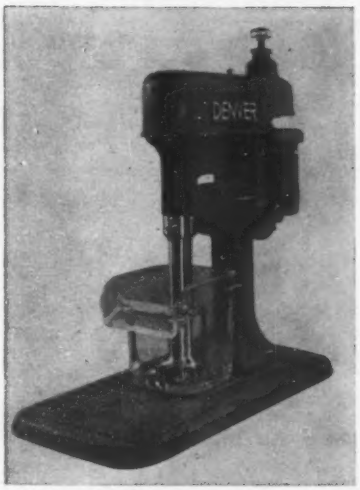
Both motors have the five cylinder radial design and the principal improvements are in the design of the air passage and of the rotary valve. The rotary valve, according to Eimco, offers better air flow and is carried on anti-friction ball bearings—there is no rubbing contact between the valve and the valve housing and the expensive bronze bushing is eliminated.

The 271 is standard on the recently-introduced Eimco 24 RockerShovel loader; the 251 on the bucket and crawler drive of all current and future Eimco 630 loaders.

Rock Drill Tool (6)

DRILLALLOY RODS have been added to Brunner & Lay, Inc.'s line of rock drilling tools. According to the company, Drillalloy is its own special analysis steel with a large blow hole and is available in 1½-in. round for use with rope threads. It is shot-peened to insure added fatigue resistance, and may be rethreaded without heat treatment.

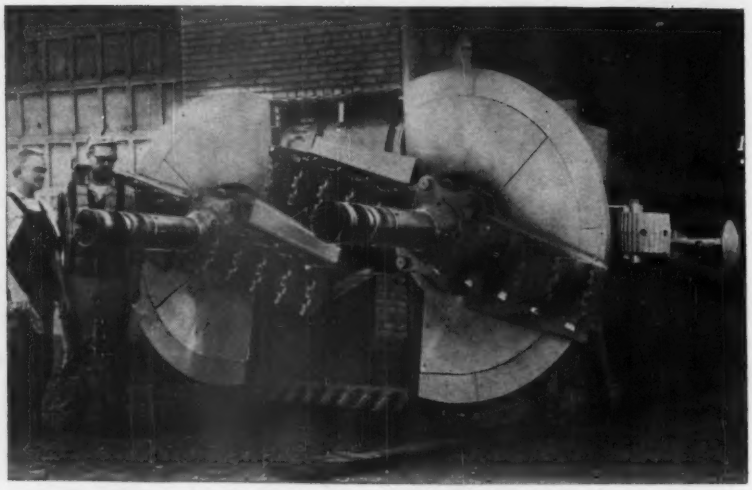
E&MJ Monitor



Flotation Bargain (5)

NEW LABORATORY FLOTATION CELL which has stainless steel suspended type mechanism, glass tank, positive speed control, has been developed by the Denver Equipment Co. Two models are being introduced—the D-1 (photo), for batch tests of 250, 500, or 1000 grams, and the D-2 for 2000 gram tests.

In observance of the Golden Anniversary of flotation, Denver is offering the new models at a discount. It will accept a $100.00 trade-in allowance for laboratory flotation machines, regardless of make, model or age towards the purchase of either the Model D-1 or D-2. Offer extends through December 31.



New Pilot-Pull Borer Draws Itself into the Rock (40)

COMPLETELY NEW boring technique, the pilot-pull principle, may have a significant influence on the future design of machines for drilling, tunneling and excavating, according to the Alkirk Corp., Seattle.

All previous boring machines achieved their thrust by pushing or bracing from behind, or the machine had to be heavy enough to provide its own thrust reaction. Machines operating on the pilot-pull principle, Alkirk said, literally pull themselves forward into the material to be bored by means of force exerted against a pilot which is anchored in the material ahead of the machine.

The pilot-pull theory was applied to the Alkirk Cycle Miner (photo), a coal mining machine which, at the Suntrana mine near Healy, Alaska, delivered coal to a conveyor at the rate of 15 tons per minute as it cut twin 7-ft bores into horizontal or pitched seams.

According to the company, the advantages of boring machines which pull themselves into the material by means of hydraulically controlled feed pressures, are:

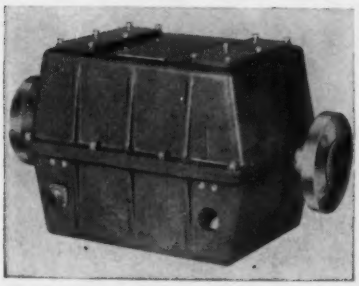
1. Machine is lightweight, compact, maneuverable.
2. No external bracing or support is required—machine anchors to material.
3. Boring possible at any angle, including vertical.
4. Boreholes are true and smooth surfaced—machine vibration is eliminated.
5. Machine is self-propelled, pulling itself forward on its anchored pilot.
6. Virtually continuous boring is possible by means of a self-advancing pilot.
7. Feed of cutting tools controlled precisely with unlimited pressures.

Super-Protected Cable (15)

FLEXIBLE, PORTABLE POWER CABLE, containing not less than 67.32% neoprene, has been developed by Western Insulated Wire Co.

The company's Bronco 66 Certified Type SH-D 5000-v cable is believed to have the safest type construction now available. It is made with a semi-conducting tape over the coated, flexible, stranded conductors. This, Western said, prevents the formation of corona and the resulting cutting of the insulation due to the build-up of ozone in the minute air space between the copper strands by distributing electrical stress over the entire circumference of the conductor. An advanced type of insulating material—Bronco XL Butyl—is placed over the tape. Its higher dielectric strength, superior aging characteristics, and ability to withstand physical shock, raise the margin of SH-D's safety above that attainable with materials previously used.

Further protection is given by the inclusion of ground wires placed in the interstices between the cabled conductors. A binder tape is wrapped around the cable assembly and over this goes the 67.32% Bronco 66 outer protecting layer.



Accurate Flowmeter (8)

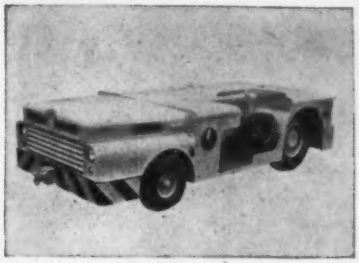
NEW ELECTROMAGNETIC FLOWMETER for measuring a wide variety of fluids and inconsistent slurries has been announced by the Hays Corp.

According to the company, the new meter handles any liquid, including viscous, with no more pressure loss than that of an equivalent length of pipe.

Hays' new unit operates at temperatures of 150°F ambient and handles liquids at pressures to 240 psi at 200°. It is unaffected by most corrosive liquids, and, because of obstructionless design, it can be cleaned using standard in-place procedures.

Here's how the new meter operates: fluid, moving through the straight pipe surrounded by a magnetic field, generates an electric signal which is directed to a high input impedance preamplifier. This unit may be located at the recorder, transmitter or between. As a result, Hays said, transmission lines are not limited in length beyond normal transmitter-recorder needs.

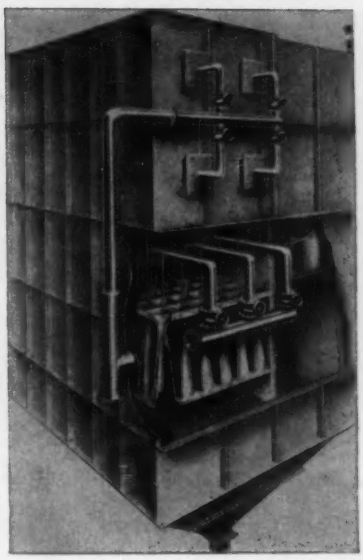
A range switch, located near the preamplifier, permits adjustment of full scale reading to one half or one tenth of calibrated full scale flow. In addition, a direct reading, continuously adjustable range control is available—permitting the establishment of full scale range at any value between 10 and 100% of calibrated full scale flow.

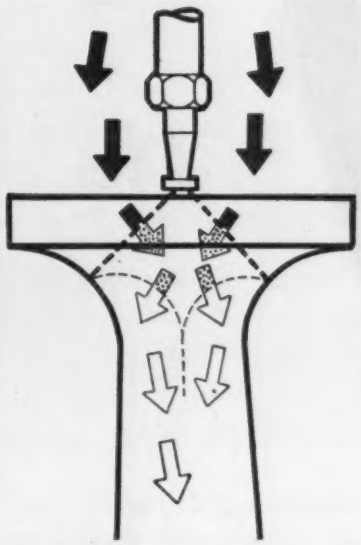


Low Powerful Tractor (9)

COMPACT, LOW-PROFILE—only 3-ft high—rubber-tired "PAYMOVER" tractor has been developed by the Frank G. Hough Co. The TD-80m is 12 ft 1 in. long, 5 ft 5 in. wide, and has a drawbar pull of 6000 to 8000 lb.

TD-80m is powered by a six-cylinder, flat diesel engine with torque-converter and automatic transmission with three forward and one reverse speed. It has hydraulic power-assisted steering and air-over-hydraulic brakes. Hood covers, Hough said, are easily removed for service accessibility.



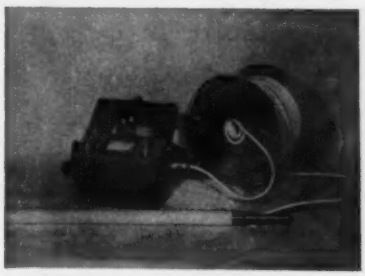


Buell Scrubber Sends Gases Through Double Spray (45)

NEW VENTURI SCRUBBER which has low water requirements and low pressure drops, which in turn give lower power requirements and lower operating costs, is being offered by Buell Engineering Co., Inc. The new unit is being manufactured under an exclusive U.S. license from Waagner-Biro, Austria.

Buell claims the scrubber is unique in that it subjects the exhaust gases to a double scrubbing action as they pass through a bank of venturis. At each venturi, a nozzle sprays a cone of water into the belled venturi entry, and the gas receives its first scrubbing. The second scrubbing occurs as the gas passes through a second inverted cone formed as the water rebounds from the belled mouth into the throat of the venturi. This deflection decreases its velocity and breaks it into smaller droplets. The velocities of the gas and the entrained solids are increased—due to the narrowing throat of the venturi—and the gas stream passes through another spray.

The new scrubber cleans gases of dust particles as small as 0.05 microns at efficiencies of 99% plus.



Drillhole Probe (23)

THE ABEM Co., Stockholm, has been appointed distributor for the OKI Permeameter, designed and developed by the Otanmaki Co., Finland.

OKI Permeameter is a compact, fully transistorized tool for quickly determining the amount of magnetic minerals in the walls of a small diameter drillhole. When cores are difficult or impossible to recover, the OKI unit draws accurate maps and sections showing ore content—and classifies it as high- or low-grade, disseminated ore, or waste rock.

The Permeameter consists of a drillhole probe with a maximum diameter of $1\frac{3}{16}$ in., an indicator calibrated to give a direct reading of magnetic percentage, and the necessary cabling. Two men can operate the instrument and can measure about 300 ft of drillhole per hr.

New Cat Buckets (22)

CATERPILLAR TRACTOR CO. has announced that nine new general application buckets — three types for each of three models—are now available for Cat wheel-type loaders. This raises to 15 the number of buckets now offered for the 966, 944 and 922 loaders.

The new buckets' extended cutting edges are induction hardened and are self-sharpening to retain good penetration throughout their service life. Cast steel corner pieces are welded both to the cutting edge and to the bucket. These corner pieces provide maximum strength to withstand heavy stresses which are concentrated on the corner of a bucket at work.

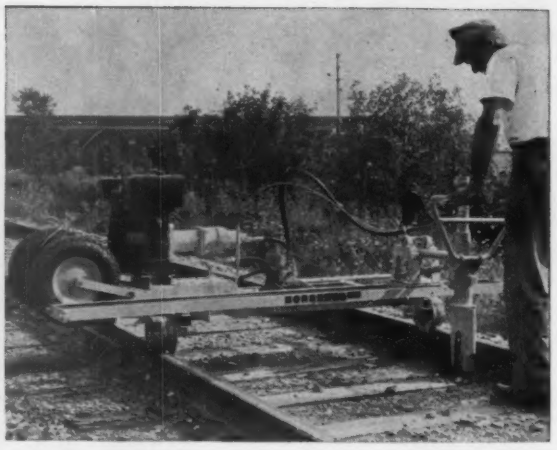
Caterpillar said the five types of buckets now available for each of the three wheel-type loaders are: standard buckets, with wrap-around cutting edges for maximum durability; light material buckets, designed to handle light, easily-loaded material; reduced capacity buckets, designed for loading heavier-than-average material; narrow width buckets, permitting cleaner dumping into small truck bodies or hoppers, and incorporating abrasion-resistant wear strips and extended wear shoes; standard width, increased capacity buckets, with additional capacity resulting from increase in bucket depth, and designed for use in aggregate plants handling stockpiled materials.

Rail-Highway Carrier (3)

NEWLY DESIGNED carrier, which can operate with ease on either road or rails, has been introduced by Crane Carrier Corp., a subsidiary of Crane Carrier Industries, Inc.

Crane said that the Model 1566 is the first to be equipped with hydraulically-operated rail guide wheels — prior models have been mechanically operated. The rail wheels retract when the carrier is to be driven on roads.

The company said their first hydraulically-operated rail-highway crane carrier will soon be shipped to Bucyrus-Erie for a model 14-B, 15-ton capacity transit crane.



Spike Puller (2)

NEW ONE-MAN-OPERATED spike puller, designed to pull spikes on both rails during tie renewal jobs, has been developed by Nordberg Mfg. Co.

The machine is called the "CHP" and its pulling gun is mounted on a pivoting, telescoping gun mount which is supported by a traversing carriage. The operator guides the gun without lifting and controls the operating valve through a lever conveniently placed on the gun's handle.

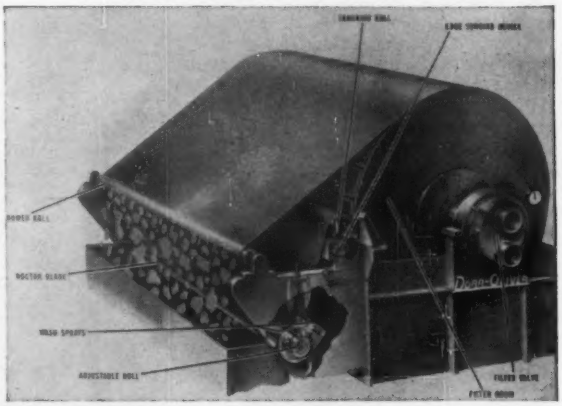
Most of the "CHP" weight is over the rail. With the rubber-tired wheels lowered and the pulling gun pivoted up and into its compartment in the frame, the unit is set on or off the track in wheelbarrow fashion.

Successful Belt Filter (20)

DORR-OLIVER INC. has introduced a new belt filter design which, it claims, finally solves the related problems of smooth application of the medium to the filter drum and uniform and controlled belt tracking.

According to the company, the new unit (D-O Webtrol Filter) applies dependable web tracking control and web spreading equipment to a new version of the basic Oliver vacuum drum filter design. A bowed roll spreads and smooths the fabric, holding the medium flat against the filter drum under uniform tension. A sensitive edge-position device operates through a modern feedback circuit to adjust continuously a tracking roll located so that it can position the belt directly on the filter drum.

The new filter is particularly applicable to slurries which tend to bind the cloth, and to operations where a sufficiently high filtrate clarity cannot be obtained with the usual types of vacuum drum filters.



All-Position Torch (21)

NEW WIRE-FEED 22-oz all-position welding torch, providing greater maneuverability and coolness than any similar product on the market, has been developed by the Westing-Arc Department, Westinghouse Electric Corp.

Rated 100 duty cycle at 200 amps, the new straight-through Model HT-1 torch, was engineered to meet the need for more efficient equipment for production of mild and stainless steels and aluminum in the light gages.

According to the company, one of the special features of the new torch is a nozzle-seat design that allows the operator, without tools, to rotate the nozzle 360° around the handle. Properly used, Westinghouse said, this can double operator speed in working difficult welding positions.

Rubber-Collared Steel (7)

SHOCK CAN BE ABSORBED and breakage reduced on ⅞-in. to 1-in. drill steel by attaching a new type hard-rubber-sleeved collar developed by Le Roi Div., Westinghouse Air Brake Co.

According to Le Roi, the rubber-lined collar eliminates the need for expensive forging and heat treating equipment, and thereby reduces the initial cost of making up drill steel.

After the drill steel surface is prepared for bonding by sandblasting or cleaning with a solvent and wire brush, the rubber collar is attached by the thrust from an accessory air cylinder.

Added to the labor and forging cost savings, the rubber-lined collar reduces the drill steel inventory needed at the mine. The water flushing hole is no longer distorted by the forging process.

OPERATING BULLETINS

Free aids to better planning

NEW 48-PAGE Handbook on Testing Sieves and Their Uses has just been published by The W. S. Tyler Co.

Tyler's handbook carries complete specifications on the new U.S. Sieve Series ASTM E-11-61, comparison of of U.S., Tyler and principal foreign standard sieve series and a list of foreign standards using the fourth root of two systems of sieve openings. **(92)**

LOUIS ALLIS CO.'S new four-page bulletin describes motors and drives used in the chemical and mineral processing industries.

Included in the presentation are the Allis gearmotors, adjustable speed drives, and explosion-proof, nonventilated, drip-proof and wound rotor motors. **(94)**

JOY MFG. CO.'s new Bulletin D-39N describes the 60-BH Champion Drill —an electrically powered rotary blasthole drill for drilling large holes in hard rock.

The 60-BH's are rated for 9- to 12½-in. holes and are available for either off-the-end or through-the-center drilling, depending on mine conditions. Maximum torque, speed and down-pressure are obtained through a combination of a shiftable transmission and hydraulic pull-down mechanisms. **(97)**

THEORY OF OPERATIONS of Lorig Aligner Type II self-centering rolls is described and illustrated in an 11-page brochure published by the U.S. Steel Corp.

According to USS, the rubber covered rolls are capable of positive centering and tracking of striplike materials under all operating conditions. **(98)**

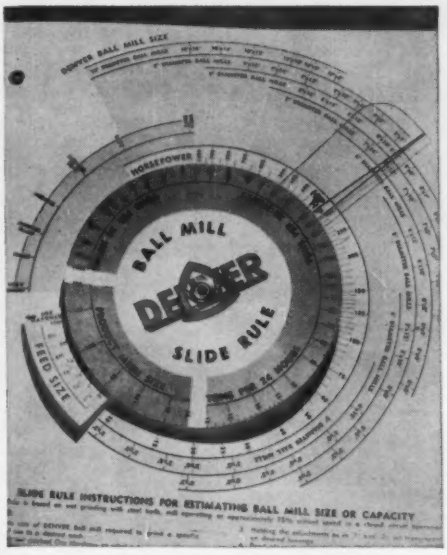
DEZURIK CORP. has published an eight page, two-color bulletin to describe the new rubber-seated bonnetless knife-gate valve. The bulletin lists features of the valve as well as materials, dimensions, actuators, and outlines the broad areas where the valve is extensively used. **(99)**

FOUR TIME- MODULATED reagent systems—two manual and two automatic—are presented in four data sheets (No. 141-RS-1 to 4) prepared by Industrial Physics & Electronics Co. The first diagrammed system provides dial selection of feed rate and simplified automatic addition of liquid chemicals and reagents, the second provides automatic feed rate control of the addition of liquid chemicals or reagents to flotation circuits or other processes, the third provides dial selection of feed rate and simplified automatic addition of lime slurry and similar reagents, and the fourth provides automatic rate control of lime slurry and similar reagents. **(100)**

ALL FEATURES of Denver Equipment Co.'s grinding mills—rod and ball—are presented in a definitive, elaborately illustrated bulletin.

After presenting general descriptions of all company units, the 51-page brochure details drives, feeders, mill production practices, laboratory equipment, liner replacement service, sole plates, grinding systems, and many other features.

A slide rule (photo) on the inside back cover is perhaps the brochure's most useful item. A typical problem which the slide rule could quickly solve would be to determine what size Denver ball mill to use to grind 500 tons per 24 hrs of medium hard ore to minus 65 mesh—feed to ball mill is minus ½ in. **(91)**



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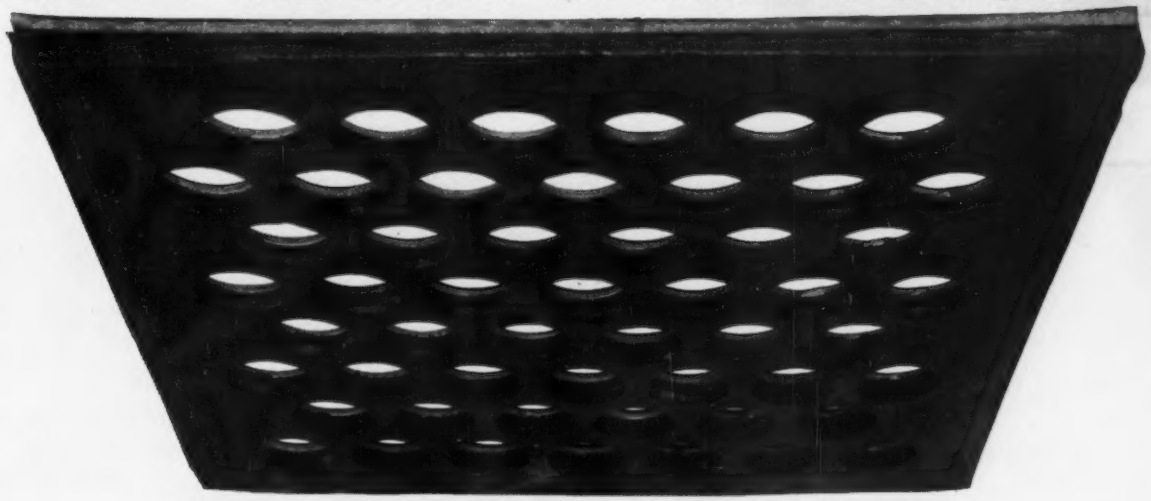
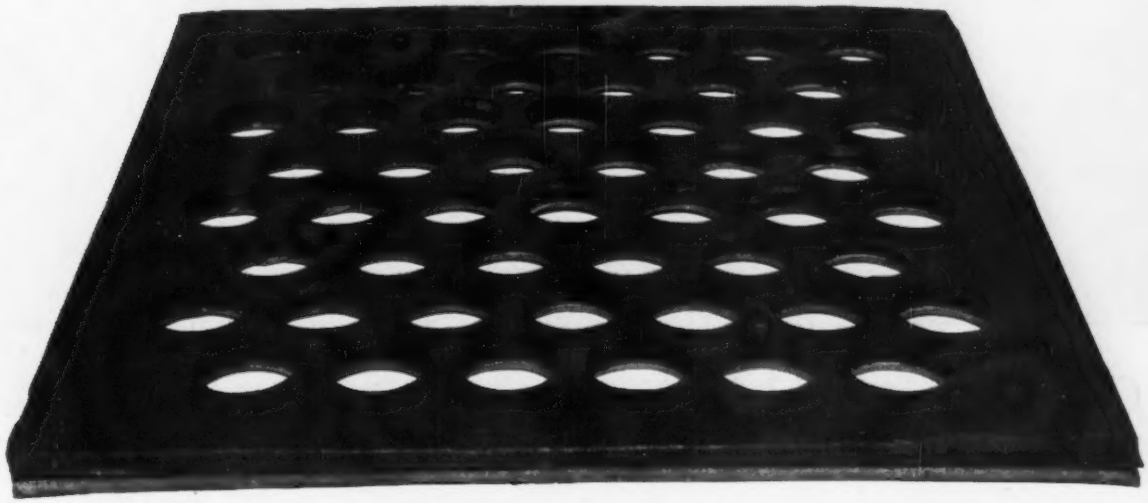
SCREEN SANDWICH OF RUBBER ON STEEL



TAKES THE BITE OUT OF ABRASION COSTS



A specially designed rubber covering protects Hendrick Perforated Metal Screens by absorbing the abrasive action of ore, coal and stone. As a result Hendrick rubber-clad metal resists plate wear under extreme screening conditions. Rubber lasts longer because it is vulcanized under controlled heat and laminated to the steel by a new adhesive.

For more information about this unusual product, we invite you to contact your local Hendrick representative (he's listed in your Classified Telephone Directory under METALS, PERFORATED) or mail in the coupon.

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engine power

BY CATERPILLAR

Here's a new profitable combination

Caterpillar-powered Gardner-Denver "Rota-Screw" portable air compressors reduce maintenance to lowest costs ever

Here is a major breakthrough in performance which means new low costs to users of compressed air. Gone are rotary blades or pistons. A helical "Rota-Screw" now eliminates blade chatter, vibration and whine. Quietness, pulsation-free air and minimum maintenance are the results.

Gardner-Denver's new SP900, a 900 CFM machine, is powered, as standard equipment, by the Cat D343 Diesel Engine. The SP600, a 600 CFM machine, is standard with the Cat D333 Diesel Engine. You get four-cycle design with full-stroke efficiency, plus full-length, watercooled cylinder liners for efficient cooling. Aluminum alloy pistons give low reciprocating weight, valve rotators distribute valve face wear and low-friction aluminum alloy bearings are known for superior strength and load carrying ability.

You'll like the Cat-powered Gardner-Denver line for the Caterpillar fuel system that provides "constant power" with *no* adjustments. Low-cost, high BTU fuels, such as household furnace oil, can be used instead of premium-cost No. 1 diesel fuel. Single orifice injectors and precombustion chamber design prevent fouling, even during long periods of idling between air demands. Electric glow plugs and ether starting arrangement are standard for quick, sure starts at below zero temperatures. Compressors are tested for a temperature range of –40° F. to 115° F.

Compressor service is available through a world-wide network of Gardner-Denver service points. In the U. S. alone there are over 5100 Caterpillar Dealer field service trucks on 24-hour-a-day call for engine service.

For more information on this new concept in compressors, write to the Gardner-Denver Company, Quincy, Illinois. Your nearby Caterpillar Dealer can tell you more about Cat Diesel and Natural Gas Engine Power for every application requiring from 50 to 950 HP, or write to Department 516, Engine Division, Caterpillar Tractor Co.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A.

OUTSIDE—covered with an abrasive sintered iron ore mix, dust and dirt.

INSIDE—completely free of contamination! Still full of grease.

STILL TURNING FREE AND EASY

after 4 rugged years ...without regreasing

Sinter plant test installation proves SEALED-IN RELIABILITY of Link-Belt idlers

This is only one of several Link-Belt standard production idlers that have logged 31,616 hours of service in four years at a steel mill. Others are still operating. When removed, this idler had made 364,216,320 revolutions, handled 11,065,600 tons of sintered iron ore mix . . . one of the most abrasive compounds known to industry. And it did it with the *original factory grease*. Link-Belt welded shut the grease fittings to prevent regreasing.

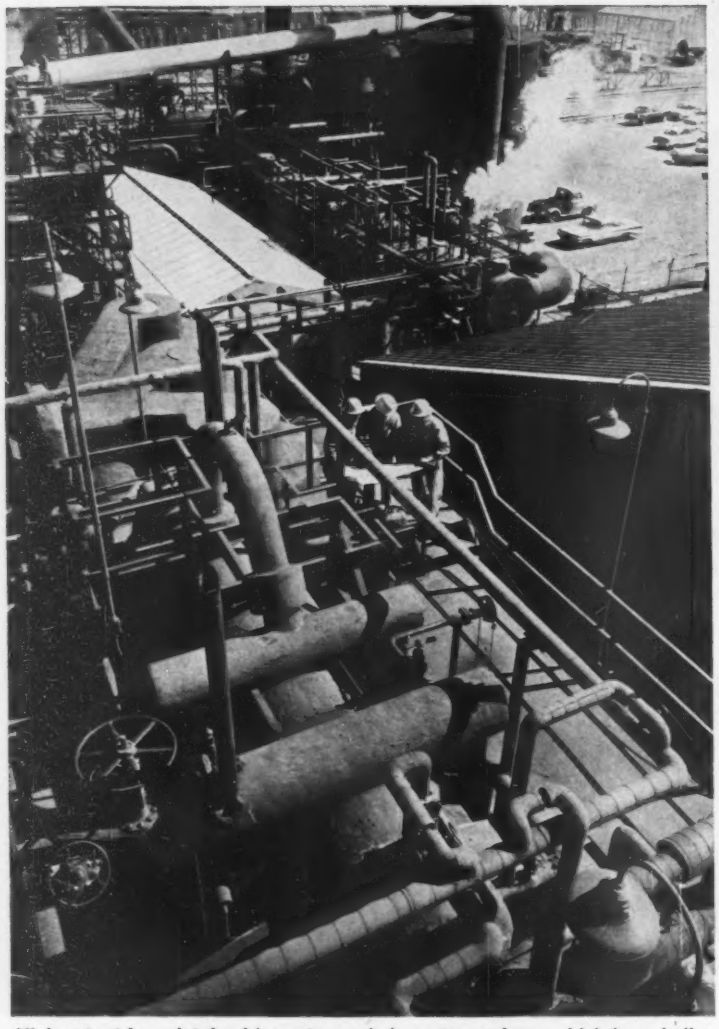
Where competitive makes failed after two years with regular regreasing, Link-Belt idlers were still turning free and easy. Disassembly revealed that the abrasive sinter mix had only begun to penetrate the outer portion of the felt-neoprene contact seal. It still had a long way to go through the grease filled multi-labyrinth seal to get to the bearing. Shafts showed no scoring. Bearings measured only a few microns wear. Thanks to Link-Belt's *exclusive* cartridge seal. And there was no apparent loss of grease from reservoir.

Here's proof of the long-lasting dependability you can expect from Link-Belt idlers. This test was so convincing that customer now specifies Link-Belt idlers *without* provision for regreasing. For further details, contact your nearest Link-Belt office or authorized stock-carrying distributor. Look under CONVEYORS in the yellow pages of your telephone directory. Ask for Belt Conveyor Idler Book 2816. 15,735

LINK-BELT

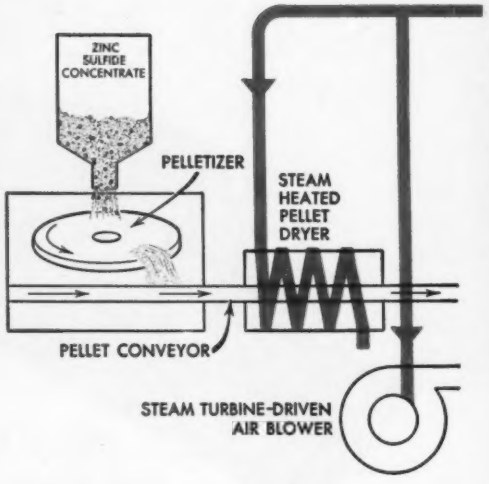
BELT CONVEYOR IDLERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World.



High output is maintained by water-cooled roaster surfaces which keep boiler tubes slag free, reducing down-time in this B&W waste-heat boiler at Sherbrooke Metallurgical Co. Ltd.

Process steam economically dries and heats the zinc sulfide ore pellets after they are formed on this pelletizer.



Integrated, efficient boiler-roaster system provides

HIGH OUTPUT, LOW OPERATING COST PLUS REVENUE FROM

Working closely with New Jersey Zinc Company and Matthiessen & Hegeler, B&W engineers integrated two B&W waste heat boilers with patented Fluid Column Roasters developed by New Jersey Zinc. The result: a highly efficient integrated boiler-roaster system now in operation at Matthiessen & Hegeler's subsidiary, Sherbrooke Metallurgical Company Limited at Port Maitland, Ontario.

LOW OPERATING COSTS Design of the roaster permits efficient utilization of the "self-burning" characteristic of zinc sulfide ore, eliminating the need for any fuel input except during startup. Process steam generated in the B&W boilers is used to dry the zinc sulfide pellets and drive the fluidizing air blowers and other auxiliary equipment.

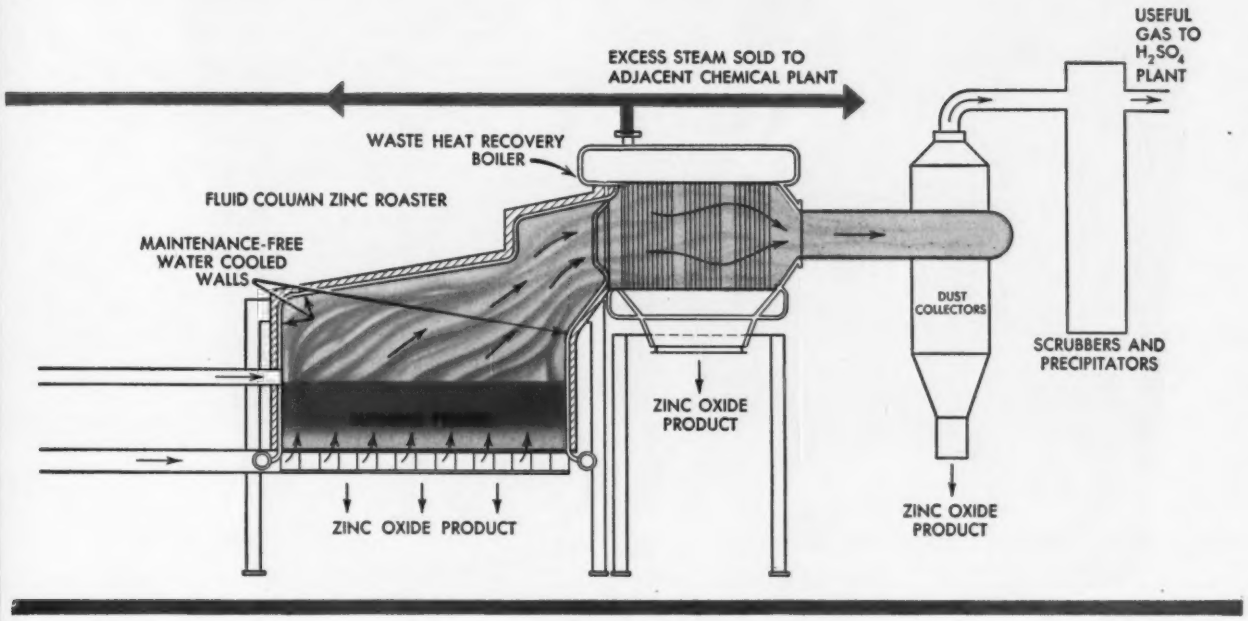
Heat-wasting methods of process temperature control are eliminated by maintenance-free, water-cooled B&W tubular surfaces in the roaster enclosure which replace costly, high-maintenance suspended refractory roofs and flues. It is believed that the waste heat recovery, in pounds of steam per pound of ore roasted, sets a new record.

Erosion is prevented and fluid bed cooling is assured by securing protective blocks to the steam generating tubes below the fluid bed level.

A gas and dust tight enclosure capable of sustaining all process pressure fluctuations is provided with B&W's inner casing design of externally-insulated steel plate welded to the boiler tubes. Canadian

Low operating cost results from self-burning characteristic of ore. Initial fuel firing is provided at start-up by the conventionally fueled burners shown above.

By-product revenue is derived from sale of steam and sulfuric acid to neighboring plants. Recovered SO_2 is converted to sulfuric acid in this acid plant.



BY-PRODUCT RECOVERY *at Matthiessen & Hegeler*

winter weather poses no problems for these outdoor units, as all steel surfaces contacted by roaster gas are maintained at temperatures well above the corrosion level.

BY-PRODUCT SULFUR RECOVERY REVENUE SO_2 gas created in the roasting process is recovered and converted to sulfuric acid. Additional revenue is realized through the sale of this by-product.

These two new units are the 22nd and 23rd B&W boilers purchased by Matthiessen & Hegeler since 1873.

With advanced engineering developments such as this, B&W – in cooperation with industry throughout the world – is applying the latest engineering developments to reduce processing costs and increase the recovery of useful energy. For more information on effective recovery of waste heat, write for Bulletin G-88. The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

B&W

ME-105

THE BABCOCK & WILCOX COMPANY
BOILER DIVISION

Specify Anaconda all Butyl Shovel Cable

This new shovel cable—the toughest in the industry—cuts shovel downtime. Months of torture testing throughout the country have proved it.

It endured the rugged cold of the Mesabi and the punishing heat of Florida's phosphate mines.

It was twisted, kinked, soaked, crushed and run over.

Its new Butyl *jacket* is the reason for this extra durability in the face of the effects of ozone and moisture and extreme physical punishment.

It is especially compounded to combine flexibility at low temperatures with thermal stability at high temperatures.

Here are other construction features which contribute to this cable's unequalled service record:

1. Anaconda's rubber-core grounding conductors offer a cushioning effect which minimizes pinching and wire breaking and offers greater ground contact protection.
2. Special shielding—a combination of copper cross-braided with cotton—eliminates chafing (and makes splicing faster and easier too).
3. Insulation is a special high-grade Butyl that withstands ozone, heat, and moisture.

Check all the features of this job-proved new shovel cable—they add up to extra cable life, less downtime, and dollar savings. Contact Department EFL-1-PQ, Anaconda Wire and Cable Company, 25 Broadway, New York 4, N. Y.

61255

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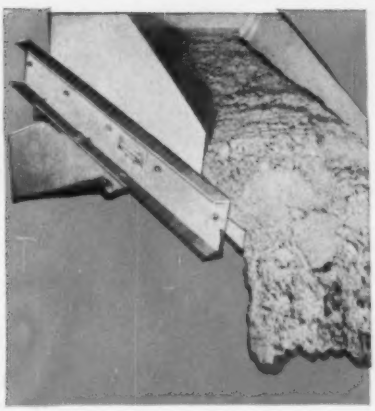
ABOUT ALL-BUTYL SHOVEL CABLE

COMING YOUR WAY

The Carrier Amplitrol Feeder Demonstrator Truck. See an actual demonstration of the greatest advance in vibrating feeders. You get less maintenance...no damping ...precise feeding control...with the simple rugged "MECHANICAL" Amplitrol.

NOW...you can see for yourself... how CARRIER AMPLITROL CUTS FEEDING COSTS!



NATURAL FREQUENCY AMPLITROL FEEDER has only two operating parts...an A. C. motor exciter and rugged pneumatic springs. Discharge rate is controlled by simply changing air pressure in the springs.

WORDS ARE NOT ENOUGH to demonstrate the unique advantages of the Carrier AMPLITROL Feeder. That's why we've mounted an AMPLITROL on a demonstrator truck to show you that seeing *is* believing when it comes to AMPLITROL advantages. You'll see why you'll get:

GREATER CAPACITY ...Size for size, AMPLITROL delivers more capacity under greater head load than any other type of vibrating feeder and feeds many "hard-to-handle" materials that other feeders can't.

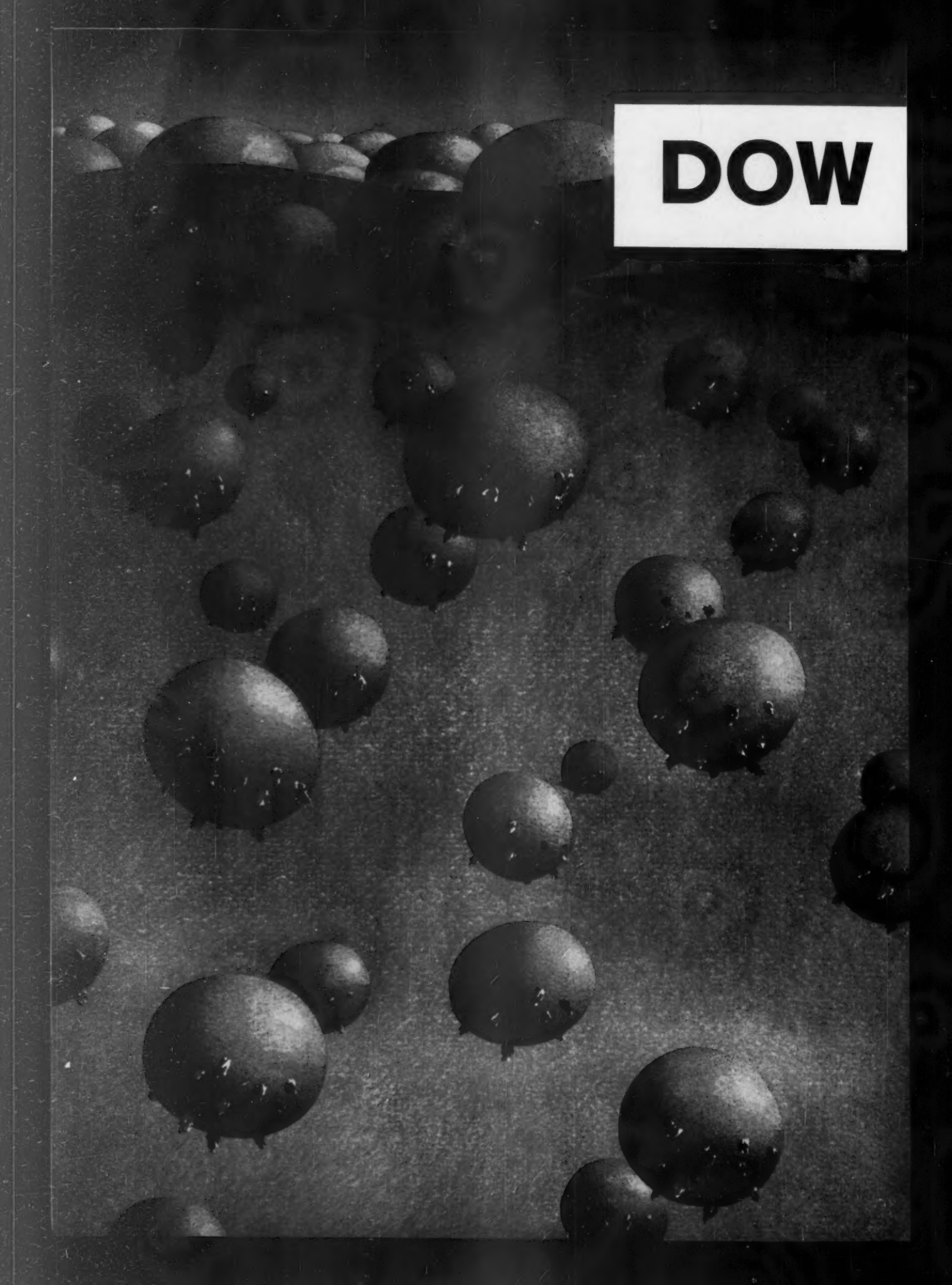
VARIABLE CAPACITY ...From a trickle to a torrent with fully variable stepless AMPLITROL capacity control.

AUTOMATIC OR MANUAL CONTROL ...Controls can be located either at the feeder or at remote locations—and can be automatically controlled from practically any process or operation.

LOW COST AND LOW MAINTENANCE ...Simple mechanical drive employs Carrier NATURAL FREQUENCY principle that assures more work with less power...less maintenance cost.

GET THE COMPLETE STORY. Write us on your business letterhead about a demonstration. We are presently scheduling dates and locations for this unit and will be happy to tell you when it will be in your area. Address Carrier Division, CHAIN Belt Company, 235 N. Jackson St., Louisville, Ky.

CARRIER NATURAL FREQUENCY **VIBRATING EQUIPMENT**


DOW

mining chemicals

DOWFROTH and XANTHATES

SWITCHING XANTHATES MAY CUT COLLECTOR COSTS

COLLECTOR POWER with xanthates is usually considered to be in direct proportion to the number of carbon atoms in the alkyl radical. For this reason, Z®-11 sodium isopropyl xanthate should be, and usually is, a more effective collector than the ethyl xanthates. In many flotation circuits, substituting the newer Z-11 has resulted in a definite reduction in the amount and cost of collector required.

Because of its high collecting power and low cost, Z-11 has become the most widely used collector of all. In any new testing program, Z-11 should receive first consideration—followed by Z-4 sodium ethyl xanthate and Z-6 potassium amyl xanthate. In any process as complex as flotation, however, exceptions are common and eventually all the xanthates should be evaluated.

For some flotation separations it is often advantageous to use a combination of *two* xanthates. For example, one of the ethyl xanthates, Z-3 or Z-4, may be used with an amyl xanthate, Z-5 or Z-6. As ore changes occur, varying quantities may be fed as required to maintain optimum metallurgical results.

Z-200, newest of the Dow flotation agents, is the result of a long search for a better collector for iron-copper separation. Z-200 is a water-insoluble liquid stable in both acid and alkaline pulps. Extensive mill use has confirmed that this product is the most selective copper or copper-activated zinc mineral collector available to flotation metallurgists today. The frothing action of Z-200 often demonstrates a substantial cost saving by reducing frothers required.

ON FRAGILE FROTHS, GANGUE DROPPAGE, AND RUBBER RUIN

SINCE DOWFROTH® flotation products are completely soluble in water, they may, like Dow xanthates, be added at any required point in the flotation circuit. This also makes the action of Dowfroth especially rapid and more easily adjustable to ore variations. Prolonged flotation stages are possible, giving a good, live froth at the tailing end of the machines with a limited number of frother additions. But despite its stability in the flotation circuit, a froth produced with Dowfroth is easily broken in the launders. The quantity of wash water going to the concentrate launders can also be materially reduced since only a small amount is required to move the froth.

Gangue droppage, being directly related to froth character, is especially good with Dowfroth. Previously used frothers frequently required deep froth columns to allow for gangue droppage, but the fragility of froths produced with Dowfroth yield equal or superior results with greatly reduced froth depth. The result: the effective volume of the flotation machine is increased and greater ore tonnage can be obtained with a given unit.

Frother attack on rubber-covered impellers, stators, and pumps frequently causes swelling and deterioration of the rubber, cutting efficiency and increasing maintenance. A comparison of Dowfroth 250 with other frothers shows that Dowfroth 250 is the least reactive on either synthetic or natural rubber.

Since ores have a way of changing just when you have everything going nicely, Dow maintains a special group of mining and milling experts who can be most helpful when problems arise. Their services are available either in writing or in person. They will be happy to assist you in any problem having to do with mining chemicals. For a copy of our new digest, *Chemicals for the Mining Industry*, write to THE DOW CHEMICAL COMPANY, Abbott Road Buildings, Midland, Mich., Attn: Chemicals Merchandising Dept. 751BD11.

DOW Midland, Michigan

Ex Uno Plura

(out of one, many)

From a single basic design, a complete engine line. That's GM Diesel's unique *family of engines concept.*

Pioneered in the thirties—and proven by over 90 million horsepower—it concentrates all GM Diesel's resources on the perfection of a *single basic cylinder design for all engines.* What does this unique *family concept* mean to you?

It means you can meet every power need, from 20 to 1008 h.p., by using engines of just 2 different cylinder sizes—with up to *70% interchangeability of parts* between engines in each series.

It means *lower parts costs*—up to 50% less than for Diesels built in a flock of different designs and cylinder sizes. Lowest servicing costs, too.

It means you can *meet growing horsepower needs* (without loss of existing parts inventory or maintenance know-how) merely by stepping up to the next engine in the series.

It means that all the advances of the past, present and future can be applied to *every* GM Diesel—whether it's in equipment you've had for 20 years, or one that's just off the line.

It means *the ultimate in standardization benefits,* with greater profits per engine on every GM engine you add.

No wonder so many equipment buyers specify GM Diesel power. Ask for it in your next piece of equipment.

Detroit Diesel Engine Division, General Motors, Detroit 28, Michigan. (In Canada: General Motors Diesel Limited, London, Ontario.)

GM DIESEL

SERIES 53 & 71 ENGINES

One proven design throughout the line builds greater value into every engine

STOP... and consider the important cost, safety and speed advantages of NATIONAL vertical load suspension devices.

National offers a family of specially engineered load suspension devices that are now being used successfully in new car designs ① narrow gage cars ② narrow body cars ③ and granby cars ④ These designs are fully proven, fully adaptable for use in new rolling stock or for use in equipment upgrading programs. Correct vertical load suspension extends equipment life, minimizes spillage, provides greater personnel safety, and speeds your operations.

A-3924A

Mine Sales • Transportation Products Division

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NATIONAL CASTINGS COMPANY
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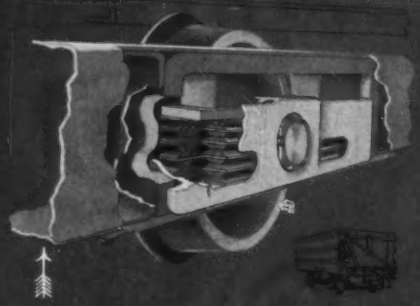
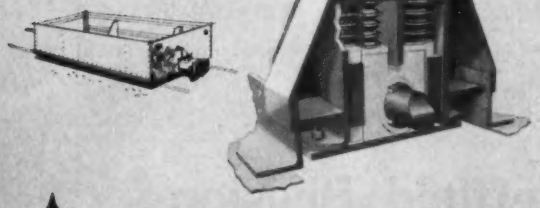
NC-1 MINE CAR TRUCKS • RUBBER CUSHIONING DEVICES • NACO STEEL WHEELS
NACO STEEL LINKS & SWIVEL HITCHINGS • WILLISON AUTOMATIC COUPLERS

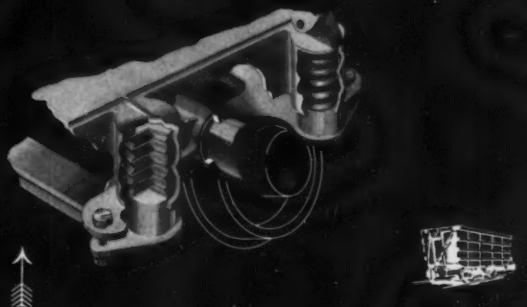
① National MI-245 rubber units, for 4-wheel rotary dump car, minimize vertical oscillation of cars through high absorption characteristics.



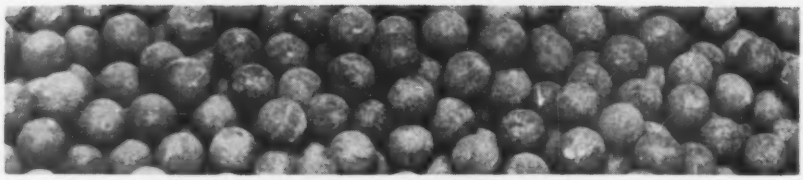
② Twin National MI-235 units used on each side of the axle center line and outboard of the wheels.



③ Twin National MI-240 units used on each side and over the axle inboard of the wheels.

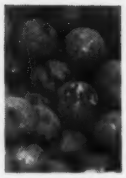


④ Twin National MI-240 units, used in narrow body cars, are located in line with wheels to eliminate side overhang.

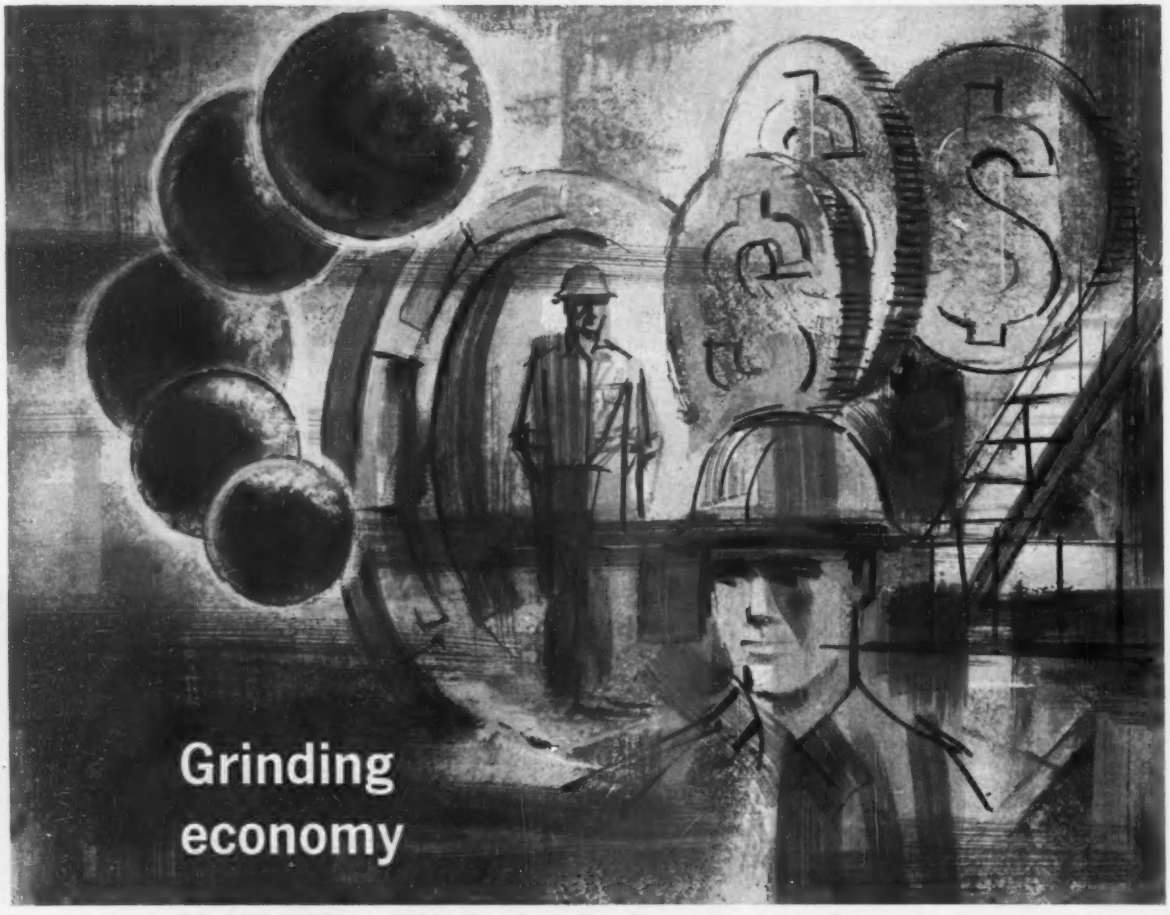


Strong
Tough
Economical
Efficient
Lasting

Steel



SHEFFIELD MOLY-COP Grinding Balls



has earned customer acceptance

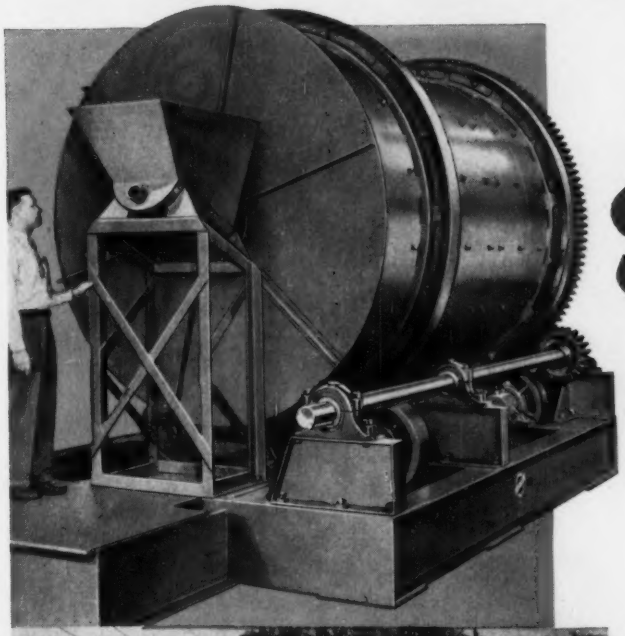
Over a million tons of Sheffield Grinding Balls have proved that Moly-Cop quality will give you better grinding at lower cost. What's behind this fine performance? Hardness, toughness and uniformity. Hardness to fight wear. Toughness to resist spalling and breaking. And uniformity of fine grain structure right to the core. That's why Moly-Cops keep their spherical shape longer, require fewer chargings and less down time, and save you money in the long run. **Sheffield Plants: Houston, Kansas City, Tulsa.**

ARMCO Sheffield Division

FOR CLEAN ORE—HIGH CAPACITY

TELSMITH

Super-Scrubbers®



● **high speed...terrific impact...grinding action much like a ball mill.** Ore travels from feed to discharge end against clean water flowing in the opposite direction —emerges clean—with clay and dirt disintegrated and carried away by the water.

low cost installation, operation and up-keep. Economical of water and power. The Telsmith Super-Scrubber is made in four sizes: 60-inch to 96-inch; with capacities of 50 to 250 tons per hour. Send for descriptive Bulletin 266.

Philippine Islands—this mill of **Baguio Gold Mining Company** is equipped with a 60-inch Telsmith Super Scrubber.

●

Minnesota—in the custom mill of **Skubic Bros.**, Virginia, Minn., a 96-inch Telsmith Super Scrubber turns out remarkably clean ore at minimum cost.

Min. 38

SMITH ENGINEERING WORKS / DIVISION OF Barber-Greene

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In 20 Anaconda ball mills...

Ni-Hard liners are good to the last 1/4 inch... cut mill downtime, cut mill costs

To save thousands of hours of downtime ...thousands of dollars in repair and replacement costs...that's why The Anaconda Company installed Ni-Hard* nickel-chromium-iron alloy liners in twenty ball mills grinding abrasive copper ore.

The proof is in the picture. The worn liner on the far right shows you how Ni-Hard liners keep their contour right down to the last fraction of an inch. That's because Ni-Hard liners not only have outstanding resistance to abrasive wear but also have a uniform wear rate so that you get higher efficiency and longer working life out of the design of your Ni-Hard liners.

Try a set of Ni-Hard liners in your mills. Just contact the Ni-Hard producing foundry in your area. They'll be glad to discuss the design characteristics best-suited for the liners in your mills, glad to give you further information on Ni-Hard liners and how they can help you cut mill-operating costs.

For further information on Ni-Hard iron feed spouts, pipe elbows, and many other parts where abrasion-resistance is required, just drop a note to Inco. We'll send you your free copy of the useful 58-page booklet, "Engineering Properties and Applications of Ni-Hard" and a list of Ni-Hard producing foundries.

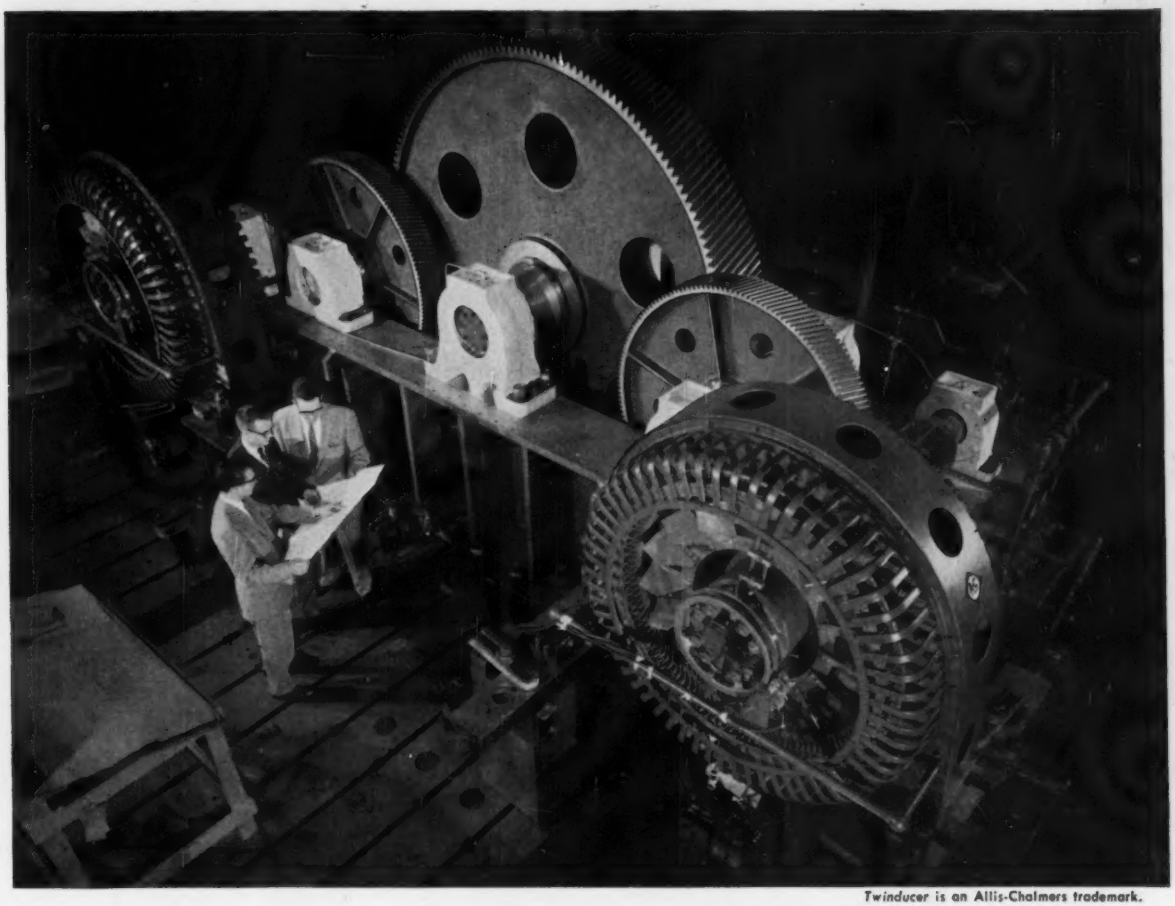
**Registered Inco Trademark*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

NI-HARD

NICKEL MAKES CASTINGS PERFORM BETTER LONGER

ALLIS-CHALMERS



Twinducer is an Allis-Chalmers trademark.

Full-load demonstration proves 98%-plus efficiency of Twinducer grinding mill drive

New, twin-motor drive system divides mill load electrically, saves space and installation costs, extends gear-train life.

To show the high efficiency of the *Twinducer* drive, Allis-Chalmers engineers recently conducted a series of full-load demonstrations at the factory.

Full load was simulated by coupling two *Twinducer* drives. Driver unit was coupled to driven unit. Load on driven unit was two equally loaded generators.

Power input to the motors was measured, and compared with the output of the generators. Efficiencies (exclusive of ordinary motor and generator power losses) were found to range from 98.48% to 98.52% . . . more than twice the efficiency of most conventional mill drives.

The *Twinducer* drive balances the load electrically, through a unique, angular rotor shift of one motor. Result is a drive arrangement that takes less space than other trunnion drives . . . and facilitates automation of grinding equipment. *Twinducer* drive cuts maintenance costs, conserves power requirements and greatly extends gear-train life.

For complete information on the new *Twinducer* drive system, see your A-C representative. Or write **Allis-Chalmers,** Industrial Equipment Division, Milwaukee 1, Wis.

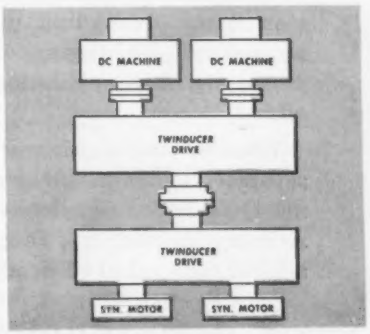
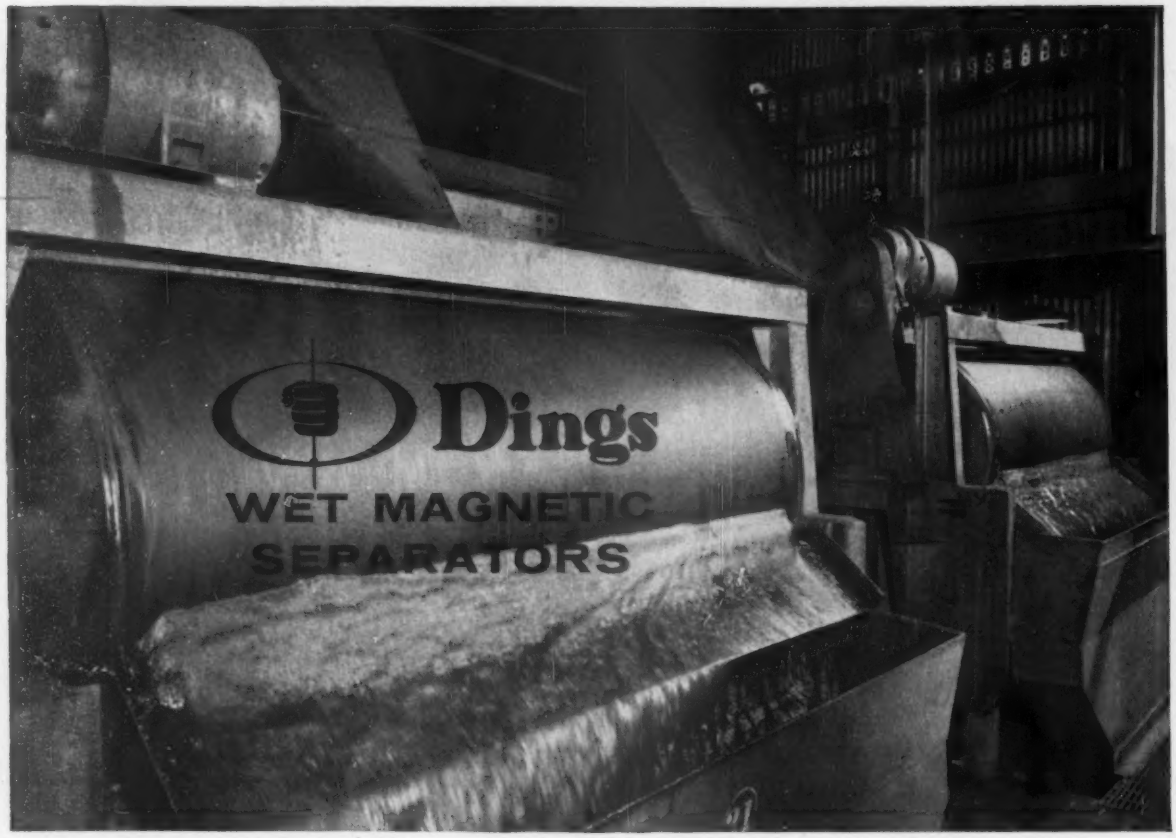


Diagram of Twinducer drive demonstration. Load is balanced electrically by a rotor shift mechanism in one of the twin synchronous drive motors. A-1514

SERVING THE FULL RANGE OF MAGNETIC SEPARATOR NEEDS



Dings has been designing and manufacturing magnetic separators for the mining industry every year during the past 60. Electro and permanent magnet wet drums have been developed which have the magnetic intensity and tank design to fit any application.

Dings makes cobbers, roughers, and finishers for taconite and magnetite, as well as heavy media separators for iron ore, coal, and aggregate, and also pyrrhotite concentrators.

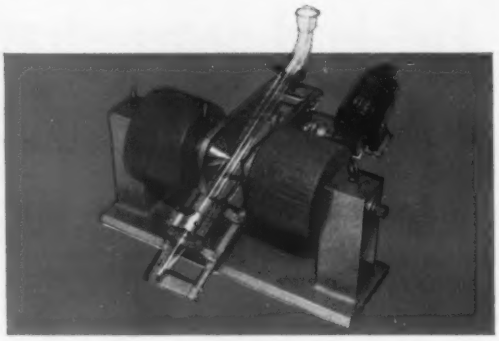
Tank construction is available in concurrent, counter-current, and counter-rotation types, depending upon separation requirement. A wide range of sizes and types, plus design and application knowledge, is offered.

Whether your requirement is for a single separator, either electro or permanent magnet type, or for complete concentration or recovery installations, Dings can help you achieve economical efficiency.

LAB AND PILOT PLANT MODELS

In addition to the commercial size separators, Dings can supply magnetic laboratory separators including the Davis Tube Tester, lab size and pilot plant size wet drums, and lab size wet submerged belt separators.

Write for free literature or send application details for a specific recommendation and quotation.



MAGNETIC ANALYSIS

The Davis Tube Tester recovers magnetic particles in samples of slurries. The percentage of magnetics in a sample can be quickly determined Useful for determination of magnetic content of ores and for checking efficiency of wet separators.

DINGS MAGNETIC SEPARATOR COMPANY
4716 W. Electric Avenue • Milwaukee 46, Wisconsin

GM-261

BIGGEST LINE

OF HIGH-PERFORMANCE SCREENS

Allis-Chalmers has it. And what does that mean to you? Assurance that you'll get *THE* screen to best help you cut processing costs and improve product flow.

Consider the screen illustrated: A high tonnage 8' x 16' model XH *ROM* scalper. This husky type screen can handle almost unlimited feed sizes and tonnages. Looks capable and it is — as are all members of the A-C line.

The dependable *Low-Head* horizontals have been solving screening problems for years. The others, *Ripl-Flo, Aero-Vibe,* the four bearing screens and the *all new,* modern heavy duty vibrating feeder, combine to fulfill any of your scalping, sizing, rinsing, washing, media drain and dewatering needs.

Ask your A-C representative to help with your screening requirements or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. A-1537

ROM, Low-Head, Aero-Vibe and Ripl-Flo are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Satisfied users?.....Proof of

Look at these LW Haulpak® results!

Repeat orders for Haulpak trucks, full fleet orders, and statements from owners* attest to lower per-ton-mile costs, *increased profit-margins* with these LeTourneau-Westinghouse haulers. Look these photo-reports over, visualize how Haulpak can cut costs on *your* operation. Five end-dump sizes . . . 22 to 65-ton capacity . . . plus a 90-ton bottom-dump. Up to 600 hp. Contact us today for full information and locations where you can see Haulpaks in action.

*Names on request

◀ **Quarried quartz — N. Carolina**
Three 27-ton LW Haulpaks proved so productive, this aggregates producer ordered *three more to replace other trucks only 8 months old.* Superintendent reports, "Production has gone from 190 up to 220 tph. I attribute this to Haulpaks because no other factor was changed."

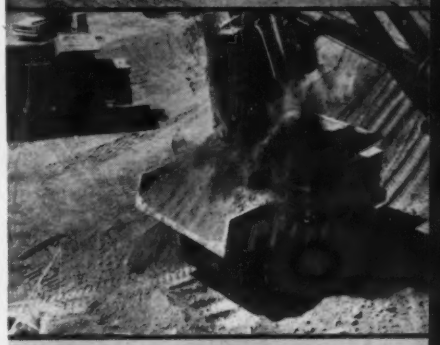
HP-2483-MOJ-2

extra profit-margin?

Bituminous coal — Illinois ▶
Six 90-ton Haulpak bottom-dumps haul coal at large strip mine (above, right). 44-mph speed of big *bottom-dumps* is fully utilized on wide, well-maintained mine haul roads. 32-ton Haulpak end-dump (right) carries refuse from hopper at wash plant to waste dump. ▶

◀ **Chemical stone — Ohio**
No downtime in more than 3700 hours operation of this 27-ton Haulpak is reported by limestone producer's shop foreman. After 24,000 miles, original tires on LW truck look good for 6000 to 7000 more. Foreman says routine servicing is fast, simple, needed only about every 135 hours.

◀ **Anthracite coal — Pennsylvania**
This company was so satisfied with two 32-ton Haulpak trucks it *ordered two more . . . and twice as large!* Comparing them with other trucks, shop foreman reports: ". . . operating expenses greatly reduced . . . less servicing, too . . . use less fuel . . . get in and out with no time wasted jockeying."



Stone quarry stripping — Nebraska ▶
Production time-study of *two* 32-ton Haulpak trucks against *three* other-make 22-ton haulers proved 2 LW's could save wages of one driver, haul 18.2% more overburden. On 7100′ hauls, total hourly advantage was 358 tons (Haulpak) to 303. Company now owns *eleven* Haulpaks.

◀ **Rock for aggregates — California**
3000 tons of material per 8-hour shift is output of three 32-ton Haulpaks at this quarry. On 2500′ hauls, down steep, winding 10% grade, deep V-body provides extra stability. Aircraft-type, multiple-disc brakes — four times bigger than on most haulers — provide safe control.

Iron ore — France ▶
5900-ft of 8% adverse grade is haul route of two 32-ton Haulpak trucks at open-pit mine. LW power-transfer differential keeps Haulpaks working when other trucks are "stuck" in hub-deep mud. Twin 3-stage hoists are inverted so abrasive dust and dirt drops out.

◀ **Copper pit overburden — Montana**
About 63 tons of earth, rock each trip are hauled to waste dump by this LW Haulpak. Operator has begun replacing his fleet with powerful, larger Haulpaks for faster removal of 250′ of overburden. Loads are hauled up 7% adverse grade at 5600′ altitude.

Mineral deposit — Tanganyika ▶
Haulpaks speed removal of kimberlite from mineral deposit in Tanganyika. Other 32-ton Haulpaks haul shovel-loaded overburden to waste pile. Hydrair® wheel suspension absorbs shocks, keeps haulers level for fast travel on rough pit floor.

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

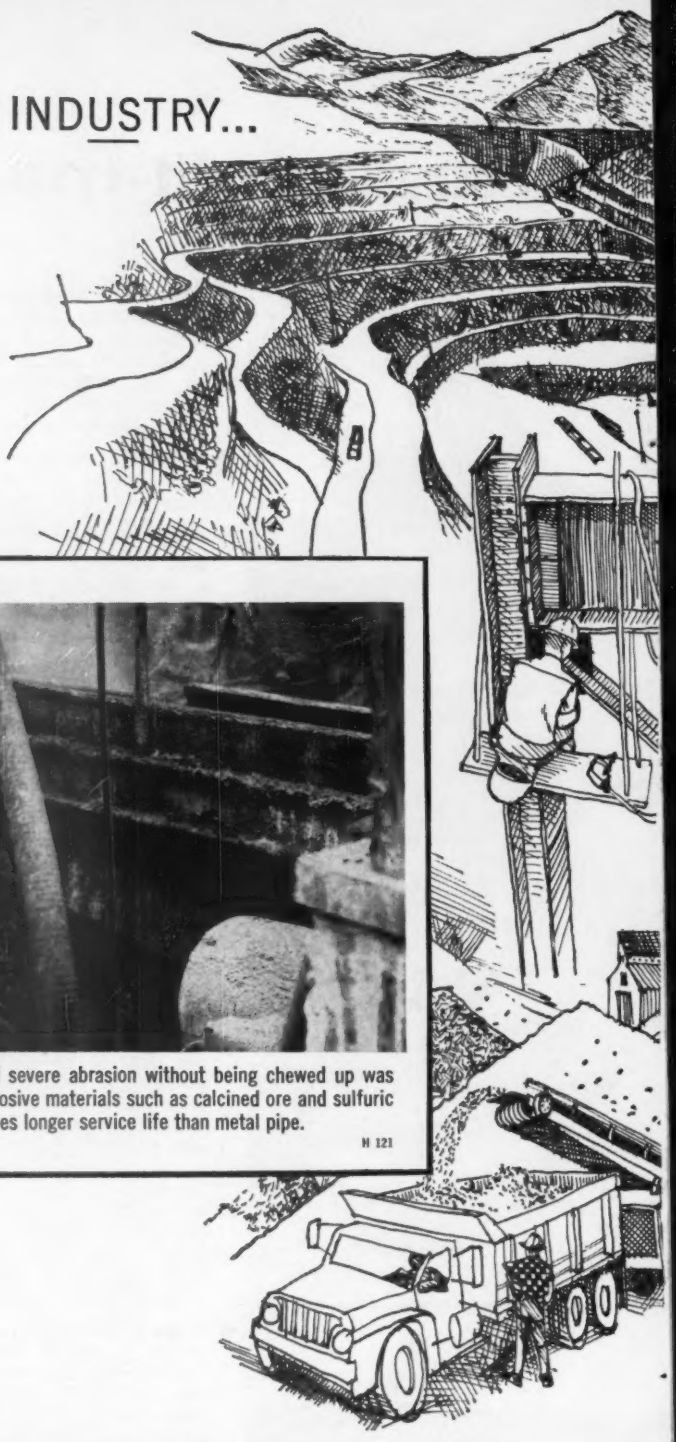
Where quality is a habit

US RUBBER

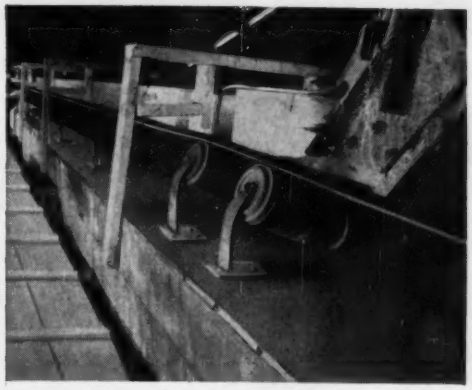
AT THE HEART OF INDUSTRY...

Union Carbide's Uravan Mill's need for flexible piping that stood severe abrasion without being chewed up was filled by U.S. Pilot® Pipe. This pipe is built to handle abrasive and corrosive materials such as calcined ore and sulfuric and hydrochloric acid. It's flexible, easy to install, won't build up... gives longer service life than metal pipe.

H 121

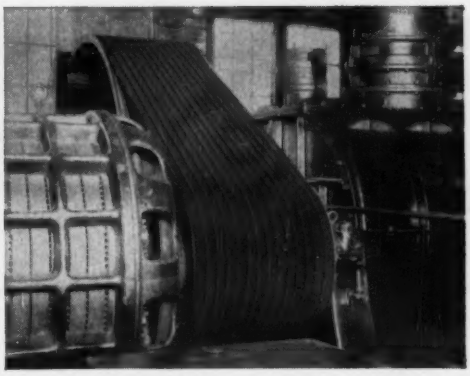


Mining and construction is rugged work, calling for products to match. And U.S. Rubber has long been known for the kind of rugged products that do more work, better, at less overall cost. That's why you'll see US products at the heart of mining and construction jobs everywhere.



Dramatically reducing maintenance and downtime for conveyor belt installations everywhere, patented U. S. Searle Sleeves protect rollers against impact damage, corrosion, build-up of wet muck, fines, and abrasive dusts. Belt wander is eliminated, edge wear greatly reduced, troughing substantially improved. Both belt and idler rollers wear far longer. SS 101

Long after other hose have failed from the cuts, abrasion, and abuse of heavy-duty work, U. S. Matchless® Air Hose can be seen powering equipment at mining and construction sites everywhere. Its unique ability to withstand the toughest treatment is but one reason why U. S. Rubber is the largest producer of hose in the world, with a complete line of hose for every industrial need. H 101



Cut costs, reduce maintenance, avoid shutdowns. In mines across the country, U. S. Royal V-Belts power fans, pumps, compressors, generators, conveyors—equipment that demands the maximum in reliability for safety as well as profit. U. S. Royal V-Belts are known throughout industry for their exceptional length stability, uniformity, and long service on drives of all kinds and sizes. VB 101

For every industrial rubber product need, turn to US. For Conveyor Belts, V-Belts, the original PowerGrip "Timing"® Belt, Flexible Couplings, Mountings, Fenders, Hose and Packings . . . custom-designed rubber products of every description. Discover why U. S. Rubber has become the largest developer and producer of industrial rubber products in the world. See your U. S. Rubber Distributor or contact US directly at Rockefeller Center, New York 20, N. Y.

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

United States Rubber

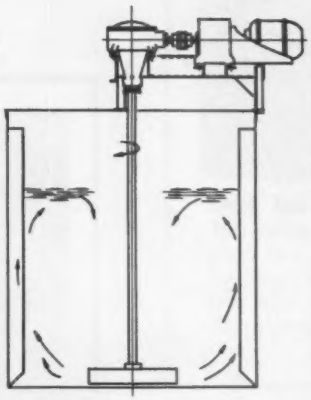
MECHANICAL GOODS DIVISION

6 TURBO-MIXERS HELP WRING PROFITS FROM BY-PRODUCTS AT BLACKWELL ZINC

For more than 20 years Blackwell Zinc Company, Blackwell, Oklahoma, employed secondary processors to recover cadmium from their baghouse dust. For the last three years they have reclaimed the valuable metal themselves, and General American Turbo-Mixers have helped them to realize maximum recovery.

The mixers are used at three stages of the operation: (1) preparation of slurry from products recovered from the baghouse, roasted and ground in a ball mill; (2) copper purification; (3) precipitation of the cadmium sponge.

"Our success with Turbo-Mixers has been such that their continued use will be given serious consideration on all future expansion for our cadmium plant," says Thomas J. Woods, Chief Engineer.



The secret lies in ability of the Turbo-Mixer to provide optimum control of the variables present while precipitating off the various elements contained in the cadmium-yielding by-product according to Mr. Woods. "In three years' operation, 24 hours a day, they have required a minimum amount of downtime," said Mr. Woods. "Most of it involved only routine maintenance procedures."

For help concerning your own processing problems, write us.

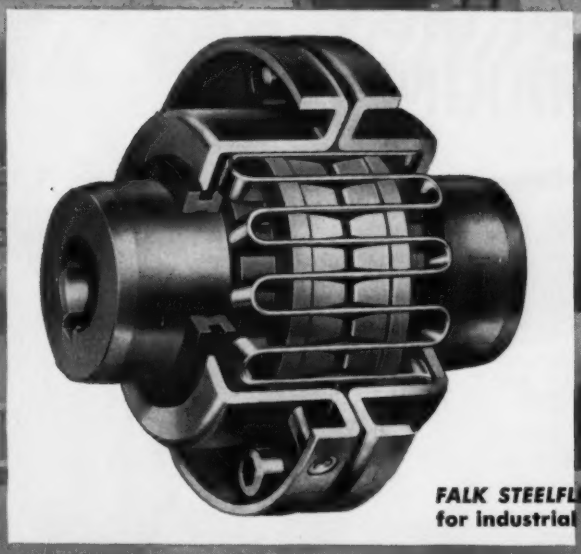
Process Equipment Division—Turbo-Mixers

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street · Chicago 3, Illinois · Offices in principal cities

FALK

A GOOD NAME IN INDUSTRY



FALK STEELFLEX COUPLINGS
for industrial applications...large or small

Giant Falk Coupling smooths out steel blooming mill performance

On a blooming mill at the Copperweld Steel Company plant in Warren, Ohio, installation of a large Falk Steelflex coupling between motor and pinion stand eliminated troublesome noise and vibration which threatened to damage mill machinery. Transmitting 5,000 hp at 50/100 rpm, this is not the largest Falk coupling... others are designed to transmit up to 130,000 hp at 100 rpm.

This installation and others like it prove the Falk concept of shaft coupling design—namely, a modern shaft coupling must contribute to the successful performance of the machinery system.

What does this mean to you? Just this: On large machines as well as small, the exclusive Falk grid-groove design does make a difference, and the difference is torsional resiliency with the strength of steel...reason enough to specify Falk Steelflex couplings as "long life" insurance for your connected machinery.

Falk Steelflex couplings are available in standard designs in 34 sizes for applications from .3 hp at 100 rpm to 130,000 hp at 100 rpm, with excellent delivery. Write for Bulletin 4100.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in most principal cities

• • •

A Point to Ponder... When you need gear drives or shaft couplings of "FALK OR EQUAL" quality, where but from Falk can you get the "OR EQUAL"?

Other members of America's First Family of Power Transmission Products

RING GEARS
Single helical or herringbone, solid or split designs. For mill and kiln applications.

• • •

DIAMETERS:
up to 23 ft. 9 in.

FACE WIDTHS:
up to 6 ft.

DIAMETRAL PITCH:
¾ to 6 dp.

• • •

HUB GEARS
Single helical or herringbone, solid or split designs. For mine hoists, special drives.

FALK and STEELFLEX are registered trademarks

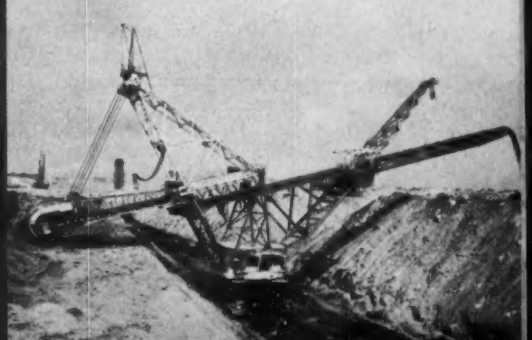
MINING REVOLUTION in the MAKING

NEW giant 3850-B is the world's largest stripping shovel with a capacity of 115 cubic yards.

NEW 480-W special walking dragline is available with bucket capacities from 12 to 18 cubic yards.

NEW 1250-W walker is available in capacities up to 40 cubic yards and boom lengths up to 285 feet.

NEW 1054-WX Bucyrus-Erie wheel excavator is one of a complete new line of wheels for large or small jobs.



Bucyrus-Erie invests in the future of mining!

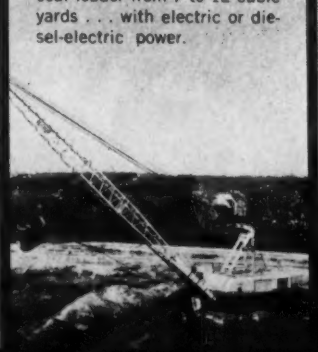
Leading the way to new production economies is a whole new lineup of Bucyrus-Erie machines . . . machines that bring you a new concept for mining efficiency. What you see here are *only a few* of many Bucyrus-Erie developments that help producers increase output and lower costs per ton more than ever before . . . new stripping shovels with capacities never before known . . . and a line of large-to-small wheel excavators.

When you look for new production economies, you are invited to consult with the only company in the world qualified to objectively recommend and sell any size, any type of shovel, dragline, wheel or drill. Bucyrus-Erie Company, South Milwaukee, Wisconsin. 4161

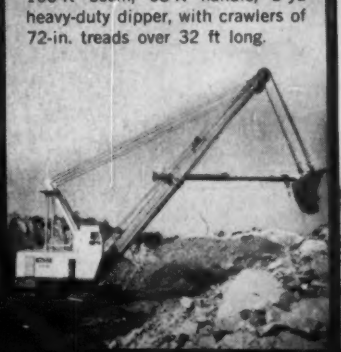
BUCYRUS-ERIE COMPANY

NEW 30-RP blast hole drill, like all Bucyrus-Erie drills is backed by the finest service in the industry.

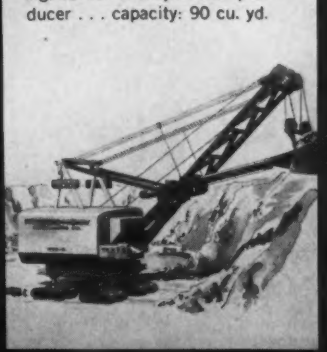
NEW 210-B is available as dragline, stripping shovel or coal loader from 7 to 12 cubic yards . . . with electric or diesel-electric power.



NEW 270-B has capacities from 8 to 18 yards . . . this model has 100-ft boom, 58-ft handle, 8-yd heavy-duty dipper, with crawlers of 72-in. treads over 32 ft long.



NEW 1850-B is a new stripping shovel now being designed for a major coal producer . . . capacity: 90 cu. yd.



"Our 48 Ford Trucks have given maximum economy in every way!"

says Fred Newkirk, Manager of Materials Transportation Company, Inc., Corpus Christi, Texas

"We are using Ford Trucks exclusively because they provide important savings—starting with a lower initial expenditure. We estimate that each Ford costs us about $1,500 less than other makes of comparable size and capacity. Our maintenance and repair costs are less, too. The greater parts interchangeability on Ford Trucks makes it possible to reduce our parts inventory by about 50%; this frees $2,500 of working capital. And in operating expenses, we save on gasoline because our Fords deliver an extra ½ mile per gallon.

"They have proven more durable, too. For example, our 1958 Ford F-1000 has logged over 160,000 miles without even having the heads or pan off. We expect 200,000 miles from these Super Duties before a major overhaul. Some of our 1955 and 1956 Ford F-900's still have their original brake linings after 300,000 miles.

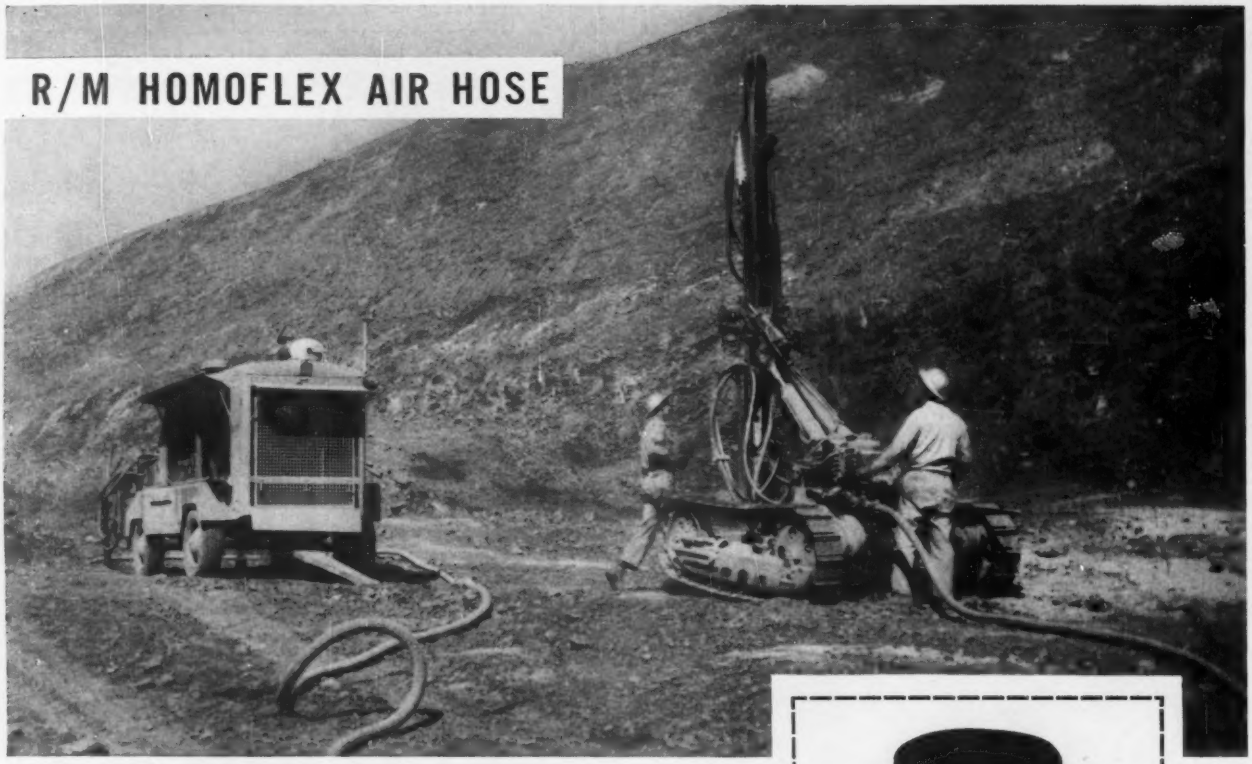
"Our trucks operate six days a week, and the average fleet mileage is 51,000 miles per week. We haul 48,000-lb. payloads of bulk cement or 37,760-lb. payloads of sack cement for Halliburton Portland Cement Company. Our drivers are also very enthusiastic about these new Ford Super Duties. They report that with 72,000-lb. grosses Fords are smooth riding and easy to handle."

Solid testimony that Ford's full-time economy only starts with low price!

FORD TRUCKS COST LESS

PRODUCTS OF Ford MOTOR COMPANY

HALLIBURTON
FORD
J-27244



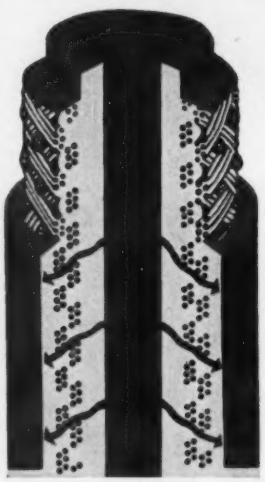
Flexible as a Rope... HOMOFLEX Handles Easier, Lasts Longer in Rugged Work

Only Raybestos-Manhattan offers unique Homoflex construction —to produce a hose that is super-strong yet flexible... and weighs less than any other air hose of equal working pressure.

- **SUPER-STRONG**—assures longer, trouble-free service life
- **PRECISION BUILT**—with super-strength, low-stretch cords
- **MANDREL-MADE**—no pre-set twist
- **KINKLESS**—coils and uncoils freely in any direction
- **HOMOGENEOUS CONSTRUCTION**—provides inseparable tube-to-cover bond
- **SAFER, EASIER TO COUPLE**—inside and outside diameters are uniform

Homoflex H. D. Air Hose is also available for extra heavy duty and with *yellow cover stripe* for visibility; also in type for water in mine use. Let your R/M distributor show you how to get More Use per Dollar with R/M hose. Write for Catalog M5.

STRONG—LIGHT—KINKLESS



EXCLUSIVE HOMOFLEX CONSTRUCTION makes strength member and tube virtually inseparable for long, trouble-free service. Uniform inside and outside diameters permit faster, safer, easier coupling—faster, fuller flow.

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION • PASSAIC, N. J.
ENGINEERED RUBBER PRODUCTS

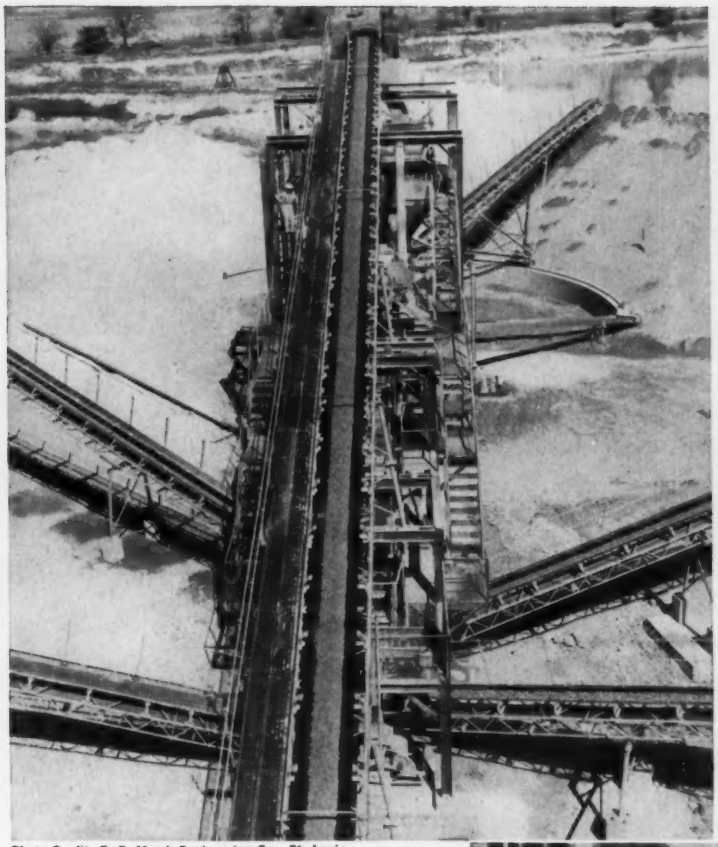


Photo Credit: E. F. Marsh Engineering Co., St. Louis, builders of the conveyors.

RAY-MAN Conveyor Belt

Troughs Deeper, Trains Easier

Ray-Man construction meets the performance requirements for Cantwell Machinery Company conveyors at Marble Cliff Quarries Company's Arrow Sand and Gravel Plant, Columbus, Ohio. Ray-Man has the flexibility and troughability to haul fuller loads—even with small pulleys, reverse bends, snub or take-up pulleys. No breaker is required . . . and Ray-Man *holds* fasteners. Also has exclusive XDC Cover for longer life.

- **HIGH COVER-ADHESION ALL AROUND**—top, bottom, and edges
- **FULL COVER THICKNESS USED**—no breaker needed—longer cover life
- **SPLICES LAST LONGER**—hold fasteners better
- **MORE TROUGHABLE AND TRAINABLE**—highly flexible, double compensated
- **IDEAL FOR 45° IDLERS**—guaranteed against separation at idler hinge line
- **OPERATES ON SMALLER PULLEYS**
- **IMPACT CUSHIONED**—resists ripping

ASK YOUR R/M DISTRIBUTOR ABOUT THE ADVANTAGES OF RAY-MAN FOR YOUR INSTALLATION.

Write for Bulletin M302.

R/M Poly-V® Drive Delivers More Power in Less Space ...With More Reliability

A single, endless V-ribbed belt across full width of sheaves with mating grooves. Gives more power per inch of width and advantages never possible with conventional multiple belt drives.

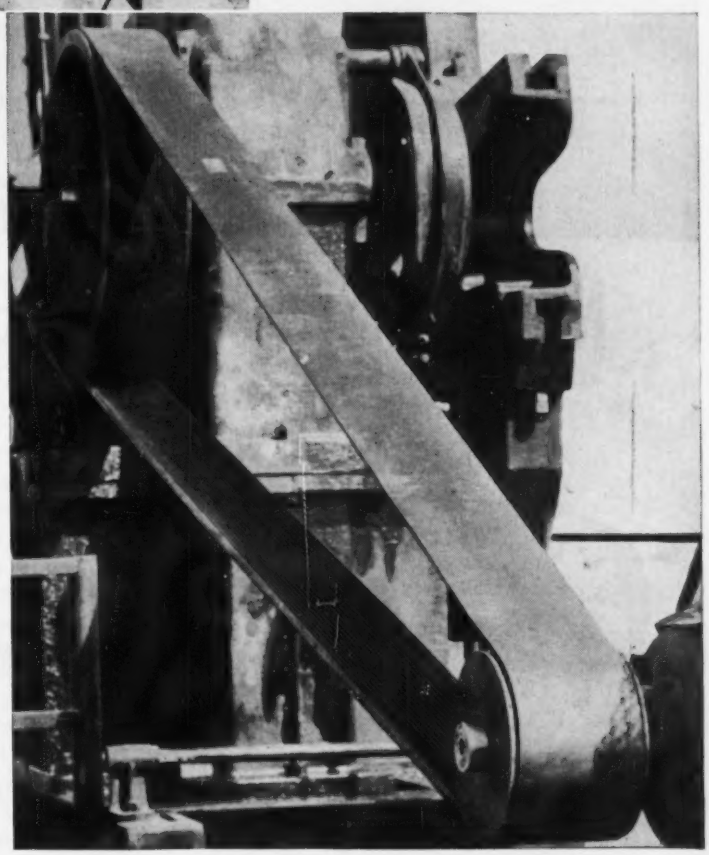
- **SIMPLICITY**—*two* belt cross sections meet *every* heavy duty requirement
- **RELIABILITY**—less maintenance, less take-ups . . . longer belt and sheave life
- **NO MATCHING**—single unit belt eliminates "length matching"
- **BETTER PERFORMANCE**—maintains groove shape, constant pitch and speed ratios . . . runs smoother, cooler

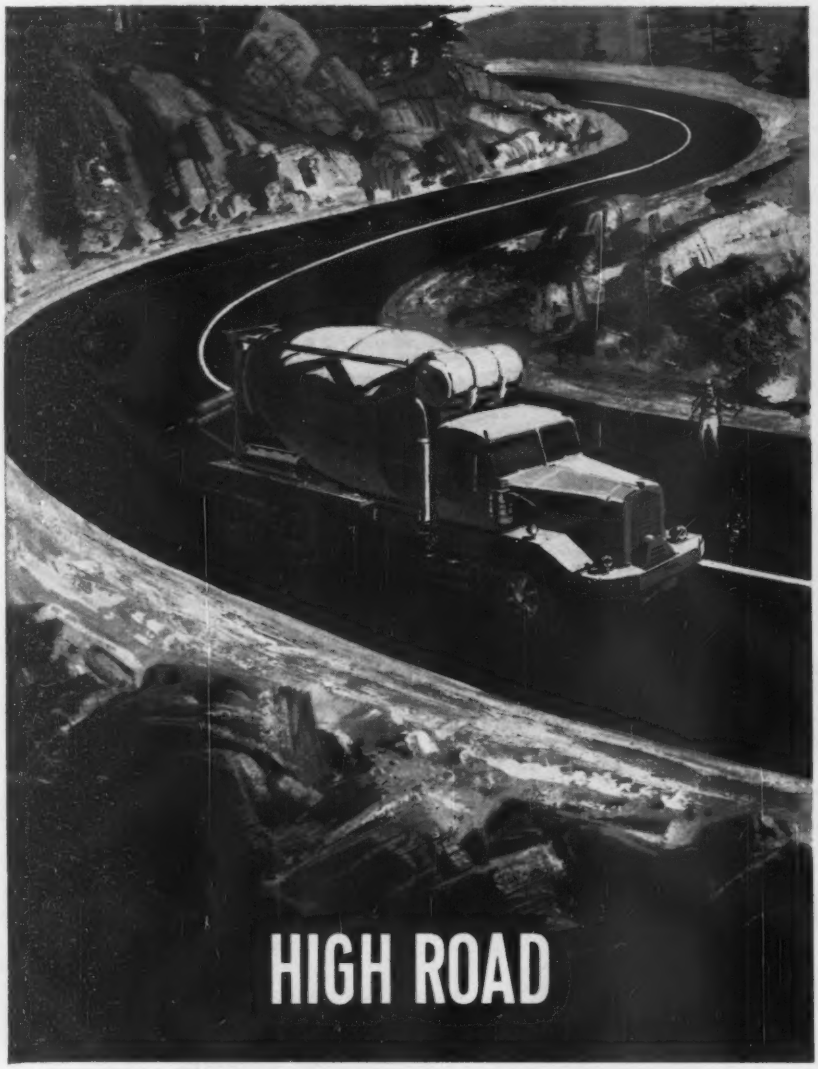
WHEN YOU CHANGE DRIVES CONVERT TO POLY-V* . . . AND BE SURE.

Write for Bulletin M141.

*patented

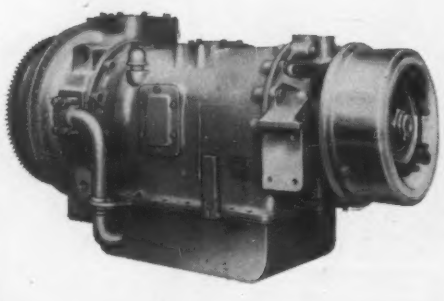
RM131





NOW A LIGHT-HEAVYWEIGHT TORQMATIC

Weighs only 985 lbs.—measures a scant



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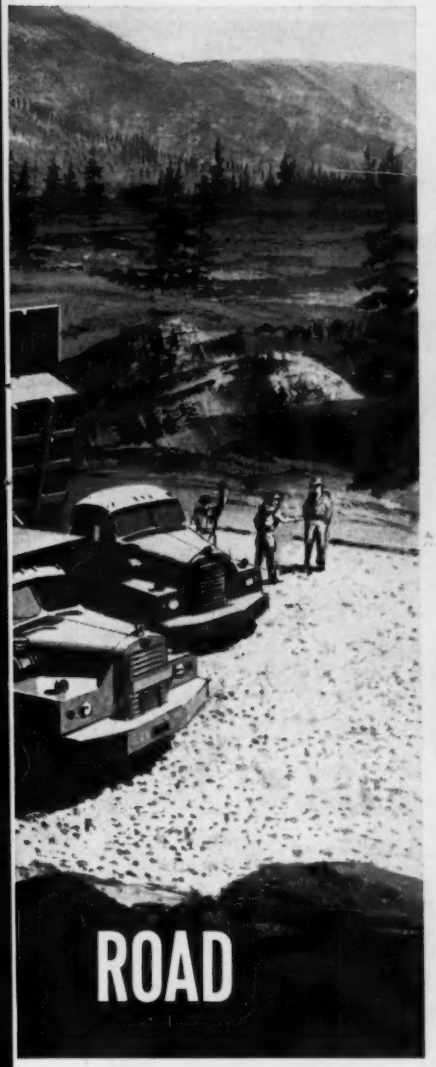

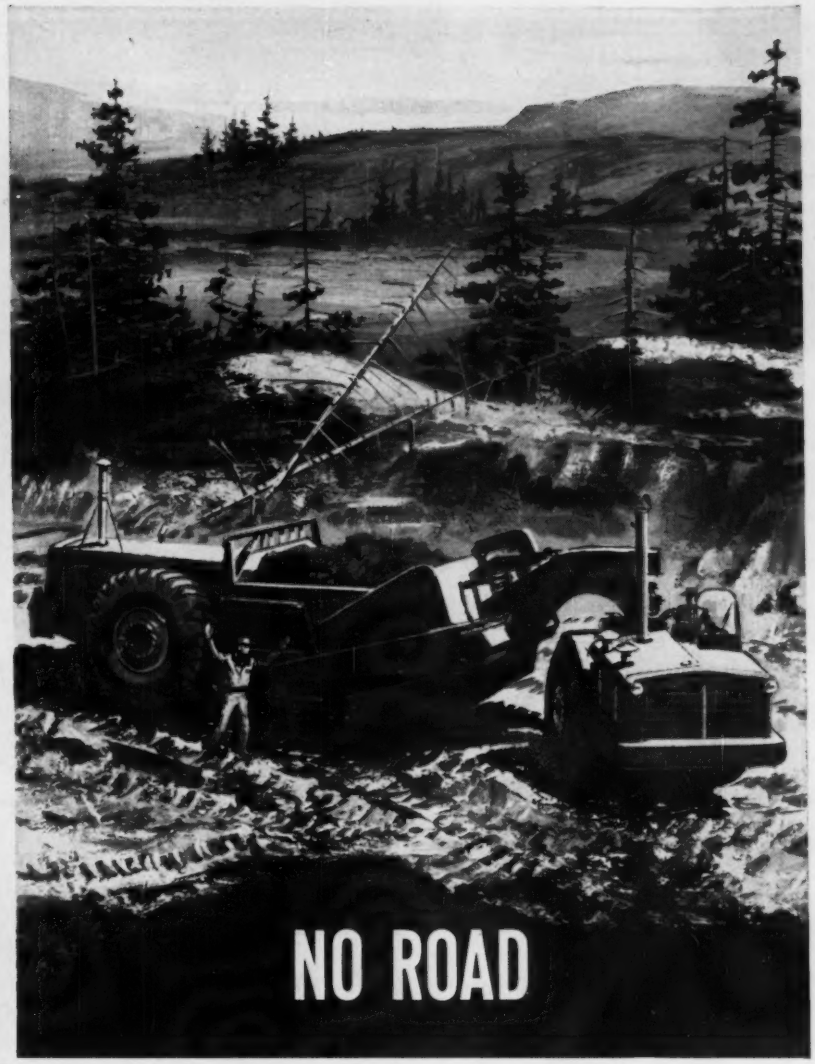

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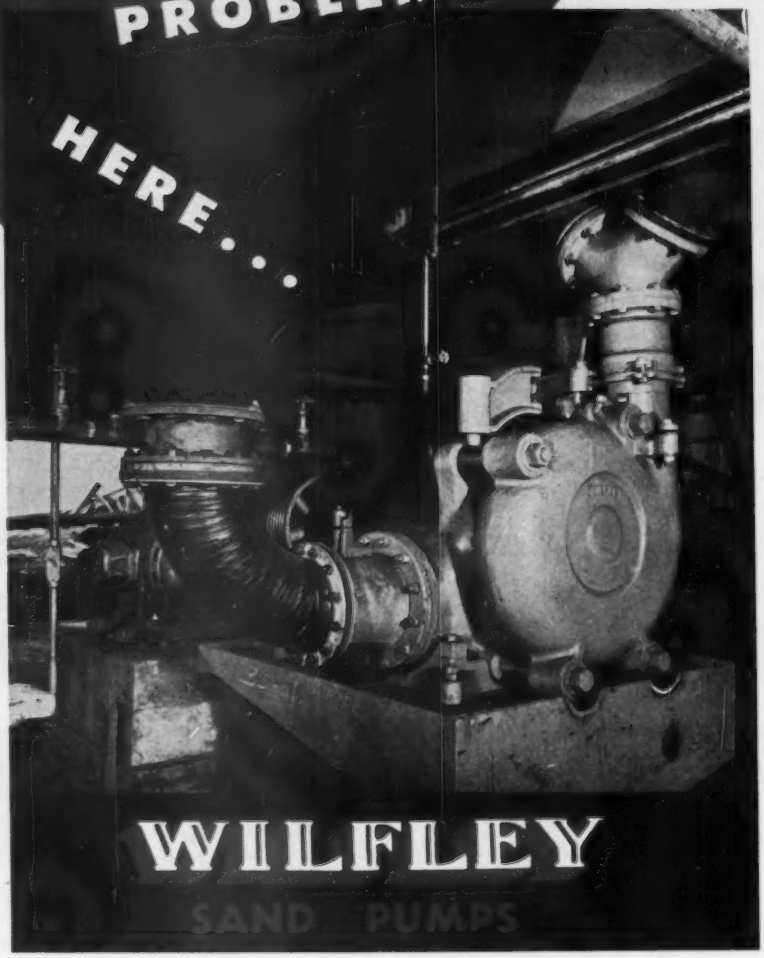

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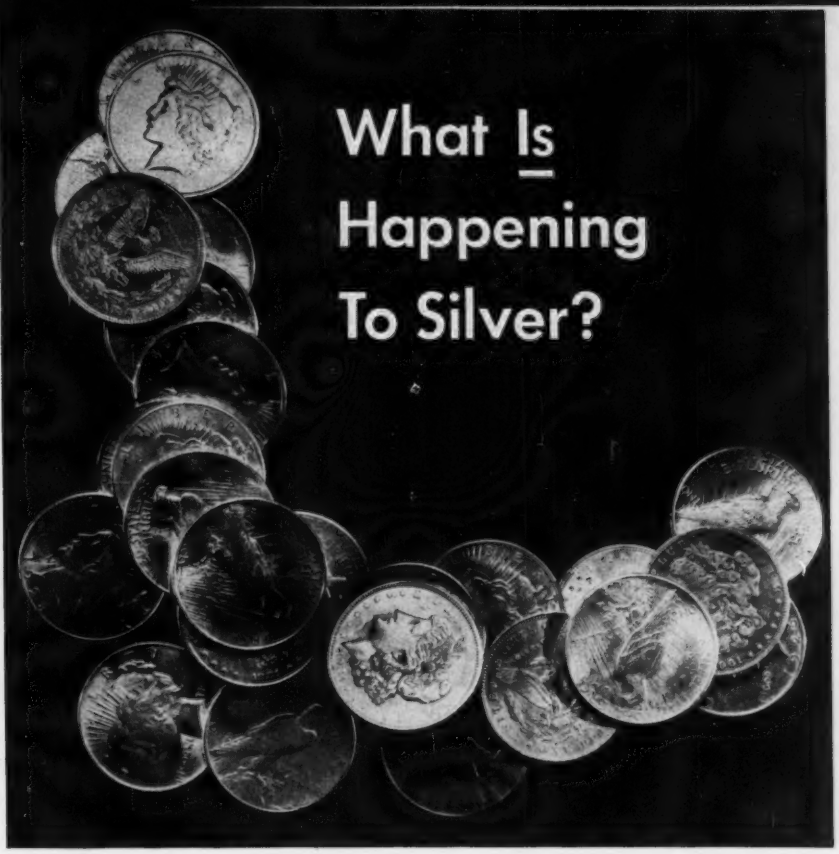


What Is Happening To Silver?

SPECIAL REPORT

AL KNOERR
MIKE EIGO

MORE THAN A YEAR AGO, specialists in the production and marketing of silver predicted that the U.S. Treasury would run out of its supply of free silver, and that silver prices would have to increase to stimulate enough mine production to supply industry with silver. This crisis is materializing, and in a matter of months silver consumers in the U.S. will have to look for new sources of supply. No one doubts that the crisis will be resolved. But how it will be resolved is a subject of considerable debate. The specific purpose of this special report is to give the reader facts on the many facets of the silver situation, and an unbiased report on the considered views of silver producers, buyers and sellers.

THE SILVER INTERESTS of the U.S. and the world, like the United Nations, are finding themselves confronted by a question of "troika." The triple symbol is a recurring one in silver, and even more difficult to handle than the traditional three-horse team.

The threes occur in all levels of the silver structure. There are the three divided influences: silver producers, silver users, and the U.S. Treasury. Then there are the three major laws which influence silver buying and selling: the Silver Purchase Act, the 1946 amendment to the July 31, 1939 silver law affecting purchase of newly-mined domestic silver, and the 50% tax on profits from trading in silver.

The troika theme continues in the three different silver stocks held by Treasury: the "sterilized" backing for silver certificates, the silver dollars on hand, and the "free stocks." And, finally, there are the three sources of silver which may be opened up as the price rises: new production, old coinage, and existing silver now being arbitrarily held off the market.

Passions Old and New

Despite protestations that silver is now more of an industrial metal than a monetary fixture (and despite the statistics that support them) it is almost impossible to hear silver discussed without passion. Even before the resounding "cross of gold" speech of William Jennings Bryan (p 93) man reacted emotionally to the question of the precious metal. Later, in lands made law-less by war, invading troops were given silver coin—the one surely negotiable currency in Europe and the Eastern and Middle Eastern nations. And, as recently as the middle of last month, U.S. Treasury officials heard passionate defences of the positions of the various silver interests now proposing a change in Government silver policy and activity.

The hearings were conducted by Undersecretary of the Treasury Robert V. Roosa as part of what his office considers a normal assessment of another of the problems facing any new Federal Administration. The Undersecretary's office emphasized that the mere fact of hearings being held and a review being carried on does not necessarily mean an immediate or near-future change of policy. Roosa, with Dr. Leland Howard, chief of the newly-created Office of Domestic Gold and Silver Operations, is responsible for recommending action to Secretary of the Treasury Douglas Dillon on the question of "free" silver stocks, and future Administration decisions.

The Dwindling "Free"

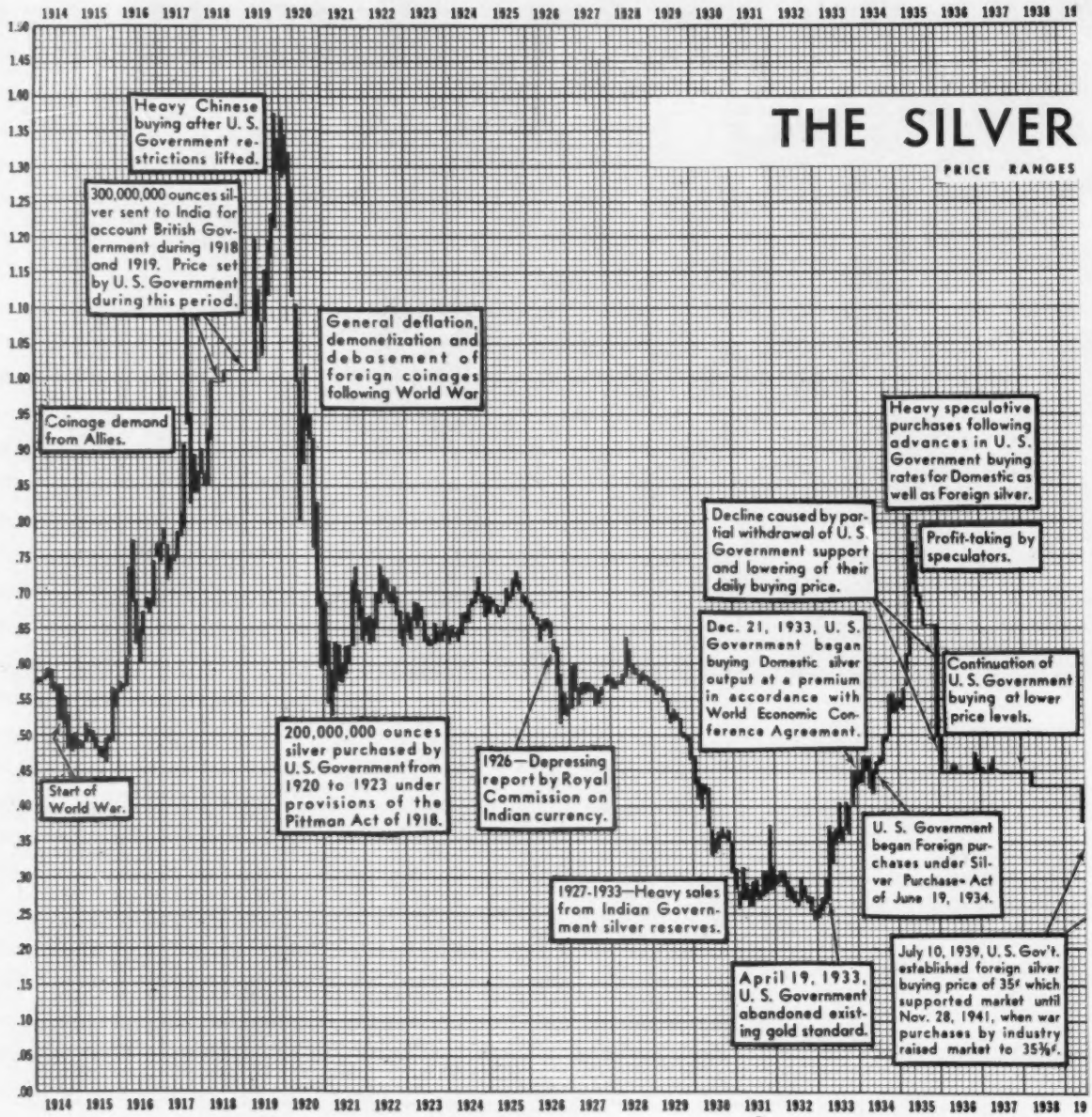
The "free" stocks are the center of the current controversy, and the point around which the various troikas are galloping. "Free" stocks is the name given to the silver held by the Treasury, in the Mint, which may be sold to U.S. users at the delivered price of 91⅝¢ per oz, and which is used by the Mint itself to make subsidiary U.S. coins (halves, quarters and dimes).

From 1946, when the newly-mined silver purchase act went into effect, the Treasury has purchased 376.6-million fine oz of domestic output (as of September 1961).

But, in 1959, industry began tapping the "free" stocks heavily for its own needs. A combination of mine strikes, purchases by foreign mints — particularly France—and other forces tightened the supply picture and demand rose. The U.S. Mint began selling heavily from its free stocks and the total on hand dropped from 210-million oz in mid-1959 to Oct. 26 figure of less than 45.5-million. The drain has been widening in recent months, and industry observers see the supply being exhausted by March or April of 1962.

Here is how the various members of the first "troika" regard the free stocks still in Treasury hands:

1) The producers. The U.S. mines which are responsible for production of newly-mined domestic silver (see listing, p 90) want the Treasury to stop the sale from free stocks right now. Their argument is that an immediate halt of free silver sales will prompt additional domestic production, bring out some silver now being


THE SILVER
PRICE RANGES
Heavy Chinese buying after U. S. Government restrictions lifted.
300,000,000 ounces silver sent to India for account British Government during 1918 and 1919. Price set by U. S. Government during this period.
General deflation, demonetization and debasement of foreign coinages following World War
Coinage demand from Allies.
Heavy speculative purchases following advances in U. S. Government buying rates for Domestic as well as Foreign silver.
Profit-taking by speculators.
Decline caused by partial withdrawal of U. S. Government support and lowering of their daily buying price.
Dec. 21, 1933, U. S. Government began buying Domestic silver output at a premium in accordance with World Economic Conference Agreement.
Continuation of U. S. Government buying at lower price levels.
Start of World War.
200,000,000 ounces silver purchased by U. S. Government from 1920 to 1923 under provisions of the Pittman Act of 1918.
1926—Depressing report by Royal Commission on Indian currency.
U. S. Government began Foreign purchases under Silver Purchase Act of June 19, 1934.
1927-1933—Heavy sales from Indian Government silver reserves.
July 10, 1939, U. S. Gov't. established foreign silver buying price of 35¢ which supported market until Nov. 28, 1941, when war purchases by industry raised market to 35⅜¢.
April 19, 1933, U. S. Government abandoned existing gold standard.

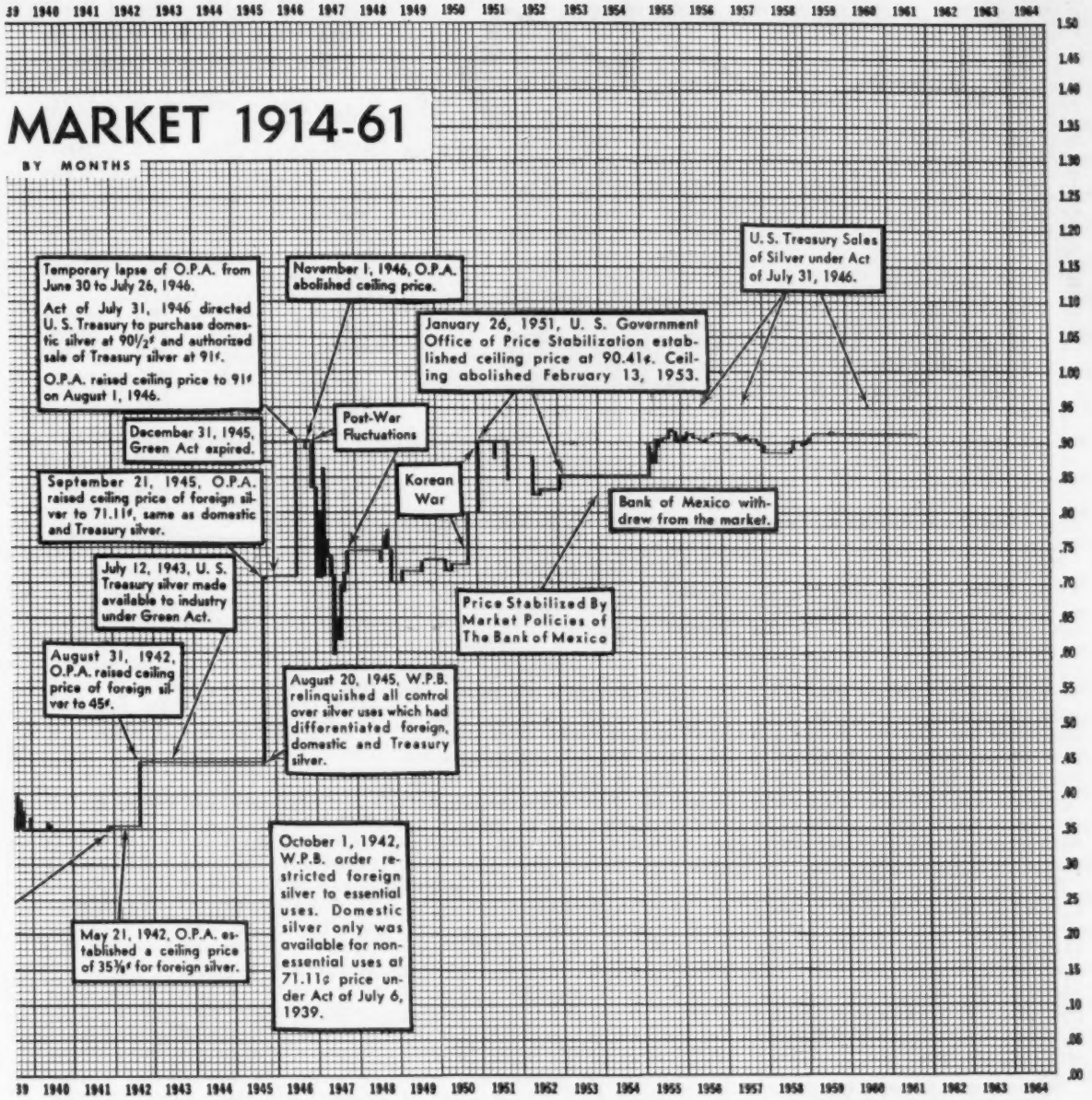
COMPLEX INFLUENCES, responsible for violent and moderate shifts in silver prices, are shown with clarity in this chart prepared by Handy & Harman. Note the impact of wars, demonetization and debasement of foreign currencies, price ceil-

held off the market, and permit the price to rise to its proper level. They feel that the longer that Treasury holds the price down by filling demand from free stocks, the more drastic will be the price jump once free stocks are exhausted and the greater will be the lag in new production. The producers want the Treasury to hold onto the remaining free stocks, if only to fill coinage needs (the Mint coined 41-million fine oz in 1959, and 46-million oz in 1960). They also point out that readily available silver has served the U.S. well in past international political crises, when it has been used to bolster the economies of weakened allies, and that it represents a strategic commodity for use in electronic defense hardware.

On the question of the various laws affecting silver, the producers see no need to repeal the 1946 "purchase of newly-mined domestic silver" amendment. They point out that the amendment says the Treasury must buy such silver at 90½¢ but only that it "may" sell from the free stocks. The producers readily admit that the insurance policy which that 90½¢ purchase clause represents is not something they'd like to lose.

There is one law which the producers would like to see repealed: the 50% tax on profits from trading in silver. The 50% tax effectively prohibits speculation in the U.S. and equally prohibits the establishment of a commodity exchange in silver. The producers (and, incidentally, the users) would like to see such an exchange in operation, both as an indicator of price and as a mechanism for sales of futures and for hedging.

Foreign producers of silver, primarily in Canada, Mexico and Peru, are equally interested in seeing the price rise. Exploration north of the


MARKET 1914-61
BY MONTHS
Temporary lapse of O.P.A. from June 30 to July 26, 1946.
Act of July 31, 1946 directed U. S. Treasury to purchase domestic silver at 90½¢ and authorized sale of Treasury silver at 91¢.
O.P.A. raised ceiling price to 91¢ on August 1, 1946.
November 1, 1946, O.P.A. abolished ceiling price.
U. S. Treasury Sales of Silver under Act of July 31, 1946.
January 26, 1951, U. S. Government Office of Price Stabilization established ceiling price at 90.41¢. Ceiling abolished February 13, 1953.
December 31, 1945, Green Act expired.
Post-War Fluctuations
Korean War
September 21, 1945, O.P.A. raised ceiling price of foreign silver to 71.11¢, same as domestic and Treasury silver.
Bank of Mexico withdrew from the market.
July 12, 1943, U. S. Treasury silver made available to industry under Green Act.
Price Stabilized By Market Policies of The Bank of Mexico
August 31, 1942, O.P.A. raised ceiling price of foreign silver to 45¢.
August 20, 1945, W.P.B. relinquished all control over silver uses which had differentiated foreign, domestic and Treasury silver.
October 1, 1942, W.P.B. order restricted foreign silver to essential uses. Domestic silver only was available for non-essential uses at 71.11¢ price under Act of July 6, 1939.
May 21, 1942, O.P.A. established a ceiling price of 35⅛¢ for foreign silver.
39 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964
1.50 1.45 1.40 1.35 1.30 1.25 1.20 1.15 1.10 1.05 1.00 .95 .90 .85 .80 .75 .70 .65 .60 .55 .50 .45 .40 .35 .30 .25 .20 .15 .10 .05 .00

ings, Government support of silver prices, and the sale of Treasury silver to industry on the price profile of silver. Careful study of this chart will lend some understanding to the arguments, often impassioned, for and against Government support of silver.

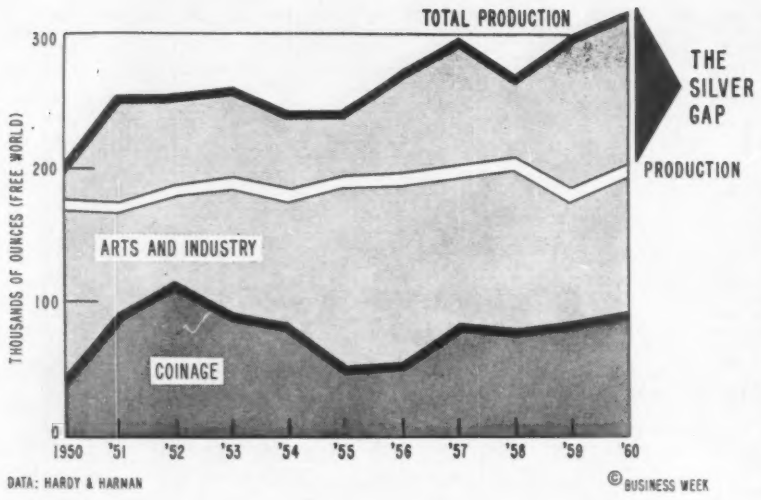
border has already increased (see listing) and Latin American miners are keeping a close watch on Treasury's moves and announcements. Mexico has several old gold and silver mines in districts which literally would be reborn with a higher silver price. But, of course, most foreign silver, like domestic output, is tied to lead, zinc, copper or cobalt, so the economics of increased silver production are influenced by many other factors than simply the silver price.

Futures on the Montreal exchange, where speculation is legal, have been edging beyond $1 (Canadian) for delivery in late summer and fall, 1962. (See table p 95.) Mexican sources have suggested that the $1 price would spur production, and Simon Strauss, vice president of American Smelting & Refining Co. and a leading spokesman for the silver producer group, has said that a price of $1.10 would bring out quantities of hoarded silver and stimulate exploration and new production.

2) The users. Dominance of the consumer side of the silver industry has passed in the past few years from makers of flat- and hollow-ware to the photographic, electronic, aircraft and soldering and brazing industries. (See section on industrial consumption.)

Users agree with the producers on two points: that change in Treasury activity in silver is called for, and that the 1934 provision which taxes silver trading profits and prevents speculation should be removed. But there the unanimity ends. Silver should no longer be regarded as a special metal, say the users, but should be freed of its political and passionate aura and allowed to act as simply an industrial metal.

Spokesmen for the users ask for repeal of all the silver acts, and removal



U.S. and Free World Production of Silver 1920-1960 (millions of fine oz-rounded)

	U. S.	World
1920	55.3	173.2
1930	50.6	248.4
1940	68.3	266.4
1941	71.1	250.6
1942	55.9	232.9
1943	40.9	195.0
1944	35.6	172.8
1945	29.1	153.1
1946	21.1	131.2
1947	38.6	157.7
1948	39.2	162.9
1949	34.9	159.2
1950	42.3	179.3
1951	39.9	175.7
1952	39.8m	191.5
1953	37.7	196.8
1954	35.6	189.4
1955	36.5	199.0
1956	38.7	200.7
1957	38.7	205.8
1958	36.8	213.5
1959	23.0	191.8
1960	30.0	

Note: Peak years were 1923 (73.2-million) and 1937 (71.3-million) for the U. S.; 1937 (270.6) and 1929 (260.9) for the Free World. Philippine production excluded throughout period. Source; Office of the Director of the Mint, U.S. Treasury Dept.

of the Treasury as an influence in the market.

They are content to see the free stocks depleted, and oppose any halt of such sales before such time as they are exhausted, claiming that the five or six months supply which remains to be bought will give them a chance to prepare for the end of the selling program and prevent an unexpected price rise. They also note that within that five- or six-month period, Congress will have returned and that new silver legislation may be forthcoming. (Congressmen from the New England states have almost annually proposed the repeal of the Silver Purchase Act.)

The users seem confident that, after a period of high prices, silver in quantity will appear and the price will drop. They appear willing to let the price rise in the present instance (and get the law repealed which guarantees a floor price of 90½¢ to domestic producers) for a future advantage when increased supply might push the price back down.

Their confidence in the program is based on an interesting evolutionary political change, one that might spell trouble for the U.S. silver miners. The so-called "silver bloc" no longer exists as a political force, say the users. Some western states which were once active members may now be found among the opposition. As an example, they offer California, whose silver production has declined drastically while new silver-consuming industries have moved in. The same, they say, is true of other western states which have been gaining aircraft and electronics industries.

The political force of the mining industry will not be unanimously aligned with the silver producers, either, say users. They note that lead-zinc areas like those in Missouri, which produce no by-product silver, will resist any Government action which might contribute to increased output from lead-zinc-silver mines—for additional lead and zinc on the market will further depress those prices.

3) The U.S. Treasury, to continue the troika analogy, is the horse in the middle. For many years the target of harsh criticism from silver users because they thought the silver price was being held up artificially, the Treasury is now the target of complaints from producers, who feel the price is being artificially held down. Treasury spokesmen indicate they don't relish their role in either case, but that they are following the letter and, they believe, intent of the law.

Dr. Howard, speaking specifically about the possible removal of the tax which prohibits speculation, notes that Treasury would insist upon keeping that provision as long as the other two rulings were on the books. In other words, as long as Treasury is a factor in the silver market, it must insist that it not be involved in speculation.

Within its silver stocks Treasury has its own "troika." This is composed of the three different silver deposits under its control as follows:

a) the free silver stock—which can be, and is being, sold to private purchasers, and which is used to supply the Treasury's own coinage needs.

b) the 106-million oz of silver kept by the Treasury in the form of silver dollars, which can be demanded by people in exchange for silver certificates. No "cartwheels" have been minted since 1935.

c) more than 1.7-billion oz in bullion to back the $2.1-billion of paper silver certificates. Some of these bills are in $5 and $10 denominations, but the greatest number are in dollar bills.

Treasury can, if it decides to ride with the current policy, face the exhaustion of the free silver stocks with equanimity. The political pressures it is now feeling will be dispelled once the free silver is gone.—And the price will rise, but the blame could not then be laid at the Treasury's—or the Administration's—door.

If it had to, Treasury could obtain coinage silver by the relatively simple expedient of retiring some outstanding $5 and $10 silver certificates. (Those bills could be replaced with Federal Reserve banknotes—already the most common form of fives and tens.) That silver from retired certificates could provide 500-milion oz, or enough to fulfill coinage requirements for more than 10 years. This could be effected without Congressional permission.

Congressional approval would be needed for the more drastic move of doing the same thing with $1 silver certificates, but few industry or government leaders see that as any more than a scant possibility in the constantly changing world market picture. And, of course, silver could theoretically be removed from all U.S. coinage, as it has been in many other nations in the post-war years, and allowed to become "just another industrial commodity." But between us and that distant theoretical time would lie

Treasury Silver

(Millions of oz)

	Dec. 31 1960	Dec. 31 1959	Dec. 31 1958	Dec. 31 1957	Dec. 31 1956
Held in Treasury:					
Securing Silver Certificates:					
Silver bullion	**1,741.8**	1,741.3	1,736.3	1,711.5	1,708.4
Silver dollars	**124.9**	141.1	156.8	169.4	182.8
Subsidiary coin	**2.0**	2.4	10.9	5.9	2.0
Free Silver bullion	**123.5**	175.1	202.2	127.4	87.4
Total treasury stocks	**1,992.2**	2,059.9	2,106.2	2,014.2	1,980.6
Outside the Treasury:					
Silver dollars	**252.3**	236.3	220.8	208.3	195.1
Subsidiary coin	**1,139.9**	1,094.7	1,046.2	1,014.6	968.0
Total Silver Outside the Treasury	**1,392.2**	1,331.0	1,267.0	1,222.9	1,163.1
Total silver	**3,384.4**	3,390.9	3,373.2	3,237.1	3,143.7

World Silver Consumption — (Partial)

(Millions of oz)

Industrial Uses;	**1960**	1959	1958	1957	1956
United States	**100.0**	103.0	85.0	95.0	100.0
Canada	**4.2**	4.4	4.6	5.8	3.8
Mexico	**4.0**	5.4	4.4	3.9	3.9
United Kingdom	**16.5**	17.5	14.8	14.7	13.8
France	**13.0**	10.6	14.1	17.9	15.9
Western Germany	**40.2**	33.3	31.1	31.5	33.1
India	**1.5**	2.0	3.3	15.0	17.5
Japan	**21.6**	13.6	8.2	8.8	7.9
Other countries (partial)	**25.0**	25.0	25.0	20.0	20.0
Total (partial)	**226.0**	214.8	190.5	212.6	215.9
Coinage;					
United States	**46.0**	40.6	38.2	52.0	31.2
Canada	**7.5**	5.7	4.7	3.8	3.2
Mexico	**2.6**	1.4	2.2	3.1	4.9
France	**12.2**	6.4	—	—	—
Other countries (partial)	**25.0**	30.0	34.4	25.1	17.3
Total coinage (partial)	**93.3**	84.2	79.5	84.0	56.6
Total consumption (partial)	**319.3**	299.0	270.0	296.6	272.5

World Silver Production (Partial)

(Millions of oz)

	1960	1959	1958	1957	1956
Mexico	**44.0**	44.1	47.6	47.1	43.1
United States	**39.0**	23.0	36.8	38.7	38.7
Canada	**32.5**	31.9	31.2	28.8	28.4
Peru	**25.0**	24.8	25.9	24.8	23.0
Bolivia	**5.0**	4.5	6.1	5.4	7.5
Other South and Central American countries	**7.0**	6.9	7.2	6.9	7.1
Total Western Hemisphere	**152.5**	135.2	154.8	151.7	147.8
Outside the Western Hemisphere (partial)	**50.0**	48.8	50.9	46.3	45.2
World Production (partial)	**202.5**	184.0	205.7	198.0	193.0

U.S. Silver Imports

(Millions of oz)

Imported from;	**1960**	1959	1958	1957	1956
Canada	**21.4**	23.5	19.6	18.0	20.0
Mexico	**10.3**	16.8	20.6	16.5	18.9
Peru	**12.2**	10.8	15.6	13.1	11.4
Bolivia	**2.7**	2.4	3.4	3.5	5.5
Other Western Hemisphere Countries	**4.0**	6.0	6.5	5.1	4.5
Total Western Hemisphere	**50.6**	59.5	65.7	56.2	60.3
United Kingdom	—	0.5	.4	22.3	67.7
Netherlands	—	—	4.3	4.7	19.3
Other European Countries	**0.1**	0.3	0.1	0.1	—
India	—	—	82.0	89.5	—
Pakistan	**4.6**	4.6	5.7	30.3	—
Australia	**1.3**	1.4	1.5	1.7	11.5
All Other Countries	**3.7**	2.8	6.2	1.3	4.0
Total Imports	**60.3**	69.1	165.9	206.1	162.8

Silver Quotations

	New York Price			London Spot		
	High	Low	Average	High	Low	Average
1960	**91.375¢**	**91.375¢**	**91.375**	**80.250d**	**79.000d**	**79.378d**
1959	91.625	89.875	91.202	80.250	75.875	78.818
1958	90.375	88.625	89.044	78.750	74.750	76.211
1957	91.375	89.625	90.820	80.500	77.125	78.927
1956	91.625	90.000	90.826	81.375	76.625	79.132
1955	92.000	85.250	89.099	80.250	73.750	77.507
1954	85.250	85.250	85.250	74.375	72.000	73.482
1953	85.250	83.250	85.188	74.000	72.875	73.945
1952	88.000	82.750	84.941	77.000	72.500	74.360
1951	90.160	80.000	89.368	78.500	70.000	77.856

U.S. Silver Exports

(Millions of oz)

Exported to;	**1960**	1959	1958	1957	1956
Canada	**1.8**	1.0	—	1.4	1.0
United Kingdom	**4.9**	2.7	0.1	3.8	1.6
France	**8.2**	1.2	—	0.1	—
Western Germany	**6.4**	3.1	1.0	2.8	0.3
Japan	**4.7**	1.1	—	—	—
All other countries	**0.7**	0.1	1.6	2.2	2.6
Total exports	**26.7**	9.2	2.7	10.3	5.5

many changes in traditional political, economic and human attitudes.

"The Silver's There"

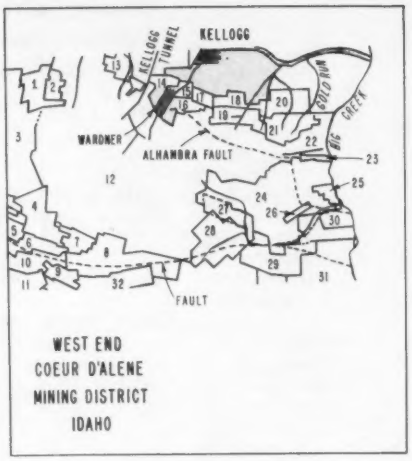
Should the Treasury's free stock be totally exhausted (and many officials are not at all sure that that will occur) there will still be silver available "at a price." Historically, whenever the price has risen, silver has arrived to meet the demand — sometimes from new production, sometimes from demonitization of old coinage, sometimes from private hoards or from silver held off the market arbitrarily.

For instance, Red China suddenly began selling silver last year and sold 4.4-million oz to buy needed food and tools. Information from London sources has it that the Red Chinese are building three silver refineries and aiming at an output of 50-million oz per year, all from the melting of old coinage.

France, which for the past two years has been a major purchaser of silver for its new "heavy" franc, may be considering a slowdown in that program, which would ease demand. Handy & Harman, the leading silver processors, note that if the French do continue with their full program — including both the five- and the two-franc coins —it will run to a total of 58-million.

Legend for Silver Map of Canada

1. United Keno Hill
2. Torbrit and Silver Standard
3. Cominco, Brittania, Sunshine Lardeau, Higland Bell, Violamac, Western Exp., Sheep Creek
4. Cobalt area (see text)
5. Quebec area; Noranda et al
6. Brunswick Mining & Smelting Corp.
7. Newfoundland



Legend for

1. Blackhawk
2. Wyoming
3. Page—Federal Mining & Smelting
4. Sidney
5. Little Pittsburg
6. Cougar
7. Nevada Stewart
8. Highland Surprise
9. Silver Reef
10. Smith
11. New Hilarity
12. Bunker Hill
13. Silver Bowl, Senator Stewart
14. Caledonia Silver Lead
15. East Caledonia
16. Bunker Chance
17. Hill Caledonia

Who and Where the Silver Producers Are

The major producers of silver (500,000 oz per year and better) represent a source of some additional silver should demand be created and attracted by a higher price. Several companies in the Coeur d'Alenes and Canada, particularly in the east, are exploring and developing orebodies primarily for their silver content. But, with a few exceptions, silver output is tied to base metal production and silver prices would have to attain high levels to make expansion profitable.

The leading producers (with output for 1959 and 1960) are as follows: (in millions of fine oz)

IN THE U.S.

	1960	1959
Asarco (mines in Can, Mex. inc.)	11.7	13.9
Sunshine Mining	6.1	6.3
Kennecott Copper	3.7	2.2
Anaconda	2.8	3.1
Galena[1]	2.0	4.5
Phelps Dodge	1.9	1.3
Bunker Hill[2]	.98	2.2
Shattuck Denn	.85	.92
Polaris (Hecla)	.84	.93
United Park City	.64	.64
Magma	.62	.36

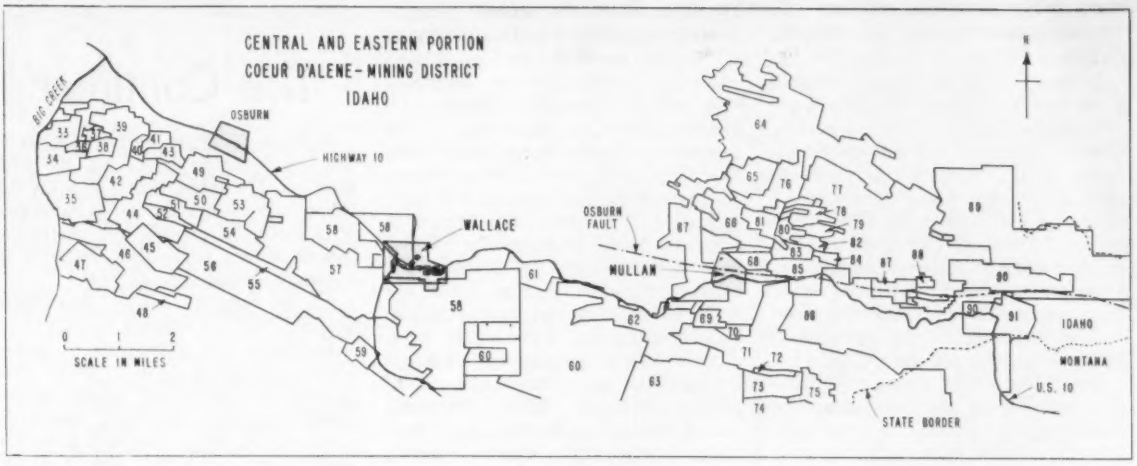
[1]Owned by Callahan Mining Corp., operated by Asarco. [2]Combination of Bunker Hill and Star Mines. Bunker Hill and Asarco suffered from a serious work stoppage in May-December 1960. All figures taken from The Yearbook of the American Bureau of Metal Statistics.

The Coeur d'Alene mining district of northern Idaho, with its role as a silver-base metal producer strongly tied to the fate of domestic silver and U.S. silver laws, had the lowest production (13.4-million oz) in 1960 that it had experienced since 1956 (12.6-million). Much of the drop from 1959's 16.4-million is traceable to the seven month strike which ran from May to December last year and halted output at Asarco and Bunker Hill mines.

Ten area mines figured in the production of silver in 1960: Sunshine, Lucky Friday, Galena mine of Callahan Mining Corp., Clayton Silver, Silver Dollar, Silver Syndicate, Polaris-Silver Summit (Hecla), Conjecture, Day Mines and Bunker Hill. Sunshine and Lucky Friday alone accounted for 64% of Idaho's 1960 production.

Sunshine is the biggest single producer in the Coeur d'Alenes. Its shaft is being sunk below the 4000 level to 4750 ft to permit development of a 4200, 4400, and 4600 level in anticipation of increased production. Sunshine has been producing more than 500,000 oz per month (for first half), totaling 3.4-million for that period. In October, the mine was briefly struck by the United Steelworkers. Sunshine had earlier reduced output while it installed new equipment which would handle increased production if warranted by an improved silver situation.

Lucky Friday, the biggest new producer in the area, installed a new mill in early 1960. With completion of a hoist installation in September, Lucky Friday is expected to boost ore input to 700 tpd. By late 1960 the mill was chalking up 98- and 99% recov-



Sketch Map of the Coeur d'Alene Mining District, Idaho.

18. Mohawk Silver
19. Paramount—New Hilarity
20. Roanoke—Hercules Mining
21. Aberdeen Idaho
22. Crescent—Bunker Hill
23. Big Creek Apex
24. Sunshine Consolidated
25. Silver Surprise
26. Bismark
27. Coeur d'Alene Central
28. Silver Belt Mining Co.
29. Bismark Mining Co.
30. Metropolitan
31. Lucky Boy
32. Blue Eagle
33. Silver Syndicate
34. Sunshine Mining Co.
35. Metropolitan
36. Polaris
37. Mineral Mountain
38. Chester
39. Silver Dollar
40. Silver Chieftain
41. Silver Summit
42. Polaris—Silver Summit
43. Nellie
44. Merger
45. Fahey
46. Idaho Leadville
47. National Silver Lead
48. Powhattan
49. Coeur d' Alene Mines
50. American Silver
51. Silver Standard
52. Sites
53. Rainbow
54. Day Mines Inc.
55. Sterling
56. Day Mines
57. Vulcan Silver Lead
58. Silver Buckle
59. Horn Silver
60. Rock Creek
61. Western Silver Lead
62. Silver Banner Mining Co.
63. East Silver Belt
64. King
65. Wall Street
66. Independence
67. Morning
68. Lucky Friday Extension
69. Genevia
70. Coronado
71. Atlas Mining Co.
72. Argenta
73. Cliffglen
74. Idaho Copper
75. Reindeer Queen
76. Pilot Silver Lead
77. Silver Mountain Lead Mines
78. Alma
79. Hibernia
80. Hunter
81. Hunter Gold
82. Homestake
83. Hunter Creek
84. Vindicator
85. Lucky Friday
86. Cortez Silver Lead Mines (Coronado)
87. Hendrickson
88. Cortez
89. Uranium Mines, Inc.
90. Princeton Mining Co.
91. Beacon Light

eries. The new hoist is to take operations down to the 5000 level.

Bunker Hill Mines, now operating at capacity after its lengthy shutdown, is also exploring extensions of its vein. The mine's phosphoric acid plant is shut down due to the seasonal slump. Capacity is 130 tpd.

Callahan Mining Co. is the owner of the Galena mine, operated by American Smelting and Refining Co. on a 75% lease, with the other 25% held by Day mines. The Galena is already one of the district's big producers and promises even better output. It, too, is exploring vein extension. The No. 3 shaft has been completed to the 1600-ft level.

The Conjecture mine of Federal Resources, Inc., is going to the 2000 level in anticipation of high silver values in the famed St. Regis formation. The mine is progressing well in its shaft sinking and development program. The company, which is also planning to develop silver properties near Bellevue, Idaho, has Ralph W. Neyman, former superintendent at Hecla, as manager of the Conjecture operation.

Clayton Silver Mines has sunk to the 800 level and is enjoying higher values at depth than those encountered earlier. The firm plans to increase its mill capacity by 50% to 150 tpd.

Other activity in the Coeur d'Alenes involves the Lincoln and Silver Dollar orebodies, which are mined by Sunshine and receive royalties; the Silver Buckle, which is developing its property near Galena and has begun geophysical surveys in the area; the Silver Syndicate, which produced 4097 tons of ore in 1960; Lexington Silver-Lead Mines, which plans reopening of the old Hibernia tunnel; and Coeur d'Alenes Mining, which may resume work in the St. Regis formation.

The Nancy Lee, at the east end of the Coeur d'Alenes, and in western Montana, is showing promise as a new producer.

In Utah, the Bear Creek operation at the Burgin shaft in the East Tintic district is also showing good values, and Keystone Mining Co. is investigating a high grade Ag-Pb-Zn find in the Park City area.

New discoveries and ordinary expansions aside, the role of the Coeur d'Alene mines as a new source of volumes of silver is moot. Simon D. Strauss, vice president of Asarco, has said that prices would have to rise 25- to 30% before new mines would be opened or old workings reopened and re-worked. Rorbert Hardy, president of Sunshine, was quoted in the WALLACE MINER as saying that, at present silver prices, Coeur d'Alene mines required 20-oz ore in order to mine at a profit. While conceding that higher prices would lower that figure, Hardy did not see any "windfall" for U.S. producers once silver was allowed to rise to an unregulated price. Dean E. F. Cook, of the Idaho School of Mines, expected 1961 to be a record year of silver production, but made his prediction before the recent work stoppages and the Sunshine reduction in output for machinery installations.

IN CANADA

	1960	1959
Cons. Min. & Smeltg.[1]	8.7	9.4[3]
United Keno Hill	6.9	7.2
Noranda[1]	5.5	5.5
Hudson Bay	1.5	1.5
International Nickel[2]	1.5	1.2
Geco Mines	1.4	1.4
Manitou Barvue	.64	.75
Normetal	.52	.58

[1]Includes production from custom work or from purchased ores. [2]Sales. [3]Millions of fine oz.

Canada's silver production is principally in the old Colbalt area of

Ontario, in New Brunswick, and from silver-lead-zinc mines in Western Canada.

In the Yukon, the area is domminated by United Keno Hill Mines, the country's largest silver producer. United Keno suffered some setbacks in the early part of the year, but expects to produce some 7.5-million oz of Ag in 1961, bettering 1959's record of 7.2-million. Consolidated Mining & Smelting Co., while statistically a bigger producer, produces silver from ores purchased from other mines than its own. United Keno is controlled by Ventures and its associates.

Two other silver deposits, of possible significance are being looked at intensively by Conwest Exploration-Central Patricia Mines and by Peso Silver Mines. The latter is examining a silver vein 15 mines west of United Keno, and the former team is examining a silver-lead-copper-zinc find more than 100 miles east of Whitehorse.

All the way to the east, in New Brunswick, the huge Brunswick Mining and Smelting Corp. lead-zinc-copper-silver orebodies will be opened up to feed a 3000-tpd mill. The high-grade orebody, which will be mined first, runs about 2.1 oz Ag and the second deposit about 1.7 oz per ton. The mill will start in 1963. In Nova Scotia, Magnet Cove Barium has made significant silver finds and Gunnar Mining is exploring the area for silver. Gunnar, in association with Lehman Bros., financiers, and the E. F. Carr group of companies, will spend $100,000 in two years in the search.

In Quebec, a board battle for control of Mattagami Lake Mines has delayed full consideration of the opening of the zinc-rich orebody which, the NORTHERN MINER says . . . "is much too good to remain undeveloped because of differences of opinion." In the dispute, Noranda Mines and Canadian Exploration were ranged against McIntyre Porcupine and members of the original Mattagami Syndicate. Noranda forces won control of the board, and plans are going ahead for developing the mine, mill and a zinc smelter. The deposit reportedly contains 1.31 oz silver in one orebody and 0.99 oz silver in another.

Siscoe Mines, in the Gowganda area of Quebec, has shown consitent gains in silver production with each quarter of 1961, and produced 1,052,183 oz in the first nine months against 1,045,048 in the same period of 1960.

In the Cobalt area, two occurences have dominated the news. The first, the long-awaited opening of a refinery to serve local mines, occurred in August, when Cobalt Refinery Ltd. shipped its first silver bullion to the Canadian Mint. The second, a resurgence in exploration and development, is directly traceable to Cobalt area producers' hopes for an improved silver market. Mentor Exploration and Development Co., according to the NORTHERN MINER, is sinking the first new shaft in the area in 30 years—to go to 410 ft, and costing $150,000—looking for silver. Rix-Athabasca Uranium Mines is deepening another shaft in the Silver Cliff group and a variety of other mining firms are either unwatering old shafts, exploring, or developing. Some of the originators of this activity are: Keeley-Frontier Mines, Glen Lake Silver Mines, Professor Silver, Pittsonto Mines, Silverside, Silvermaque, Rayrock, Botha Lake, United Cobalt, Pickering Metal, Agnico, and Deer Horn, which began milling recently after a seven-month lapse in operations.

The Canadian Government, which purchases silver through the Royal Canadian Mint, has lately found itself buying silver from the U.S. as well from its own mines, and paying the market price for it.

In the first six months of 1961, the mint purchased 1,946,279 oz in Canada at prices ranging from 90.2¢ to 91.88¢ per oz. (The U.S. equivalent would be 91.375¢). During the same period, foreign purchases—largely if not all from the U.S.—totaled 3,001,503 oz at prices ranging from 90.948¢ to 94.964¢ per oz (U.S. 91.606 to 94.433¢).

Canadian silver production in the first seven months of 1961 from all sources totaled 18,177,653 oz (against 19,193,349 in 1960, same period).

Canada does not offer any incentives to domestic producers (as it does for gold) and it does not have a preferential buying program.

Third quarter figures from Temiskaming Testing Laboratories, at Cobalt, which handles output from the Cobalt-Gowganda area, show total silver production of 141,665 oz silver bullion and 604,540 oz in concentrates. The figures represent a decline from first and second quarter totals.

IN MEXICO

	1960	1959
Fresnillo Co.	5.5	5.3[1]
San Francisco	3.6	3.7
San Luis	2.8	2.6
Howe Sound	1.3	1.0

Note: Fresnillo and San Francisco Mines are in the process of being "Mexicanized" (51% owned by Mexican nationals) [1]Millions of fine oz.

OTHER LATIN AMERICA

Aguilar (Argta)	1.7	1.9
Aramayo (Bolva)	3.3	2.9
Cerro (Peru)	14.2	11.0
NY Honduras	2.5	2.8

The Continuing

William Jennings Bryan may have lost the battle in 1896, but the war goes on. The latest skirmish is taking shape in Washington now, as Administration officials grapple with the problem of silver's ambiguous status. Is it currency, commodity, or both?

As a currency, silver has been plagued with an uneven history.

Following the upheavals of revolution, the U.S. (in 1792) and France (in 1803) had legally established a double monetary standard. England, in 1816, adopted a single (gold) standard. But the rest of Europe and the countries of the East recognized silver as their sole currency. To add to the confusion, the discovery of significant quantities of gold in California in 1848 and in Australia in 1857 led to the dominance of gold in both the U.S. and in France (which, between 1848 and 1860, coined more than £ 100-million in gold, exporting an equivalent amount of silver to the eastern nations).

By this time, international opinion was strongly in favor of the adoption of a single (gold) standard, at least for the purposes of international trade, and in 1865 the Latin Monetary Union was formed by France, Belgium, Switzerland, Italy, and, later, Greece. In 1867, an international conference unanimously accepted gold as the monetary standard for the international system, but a coincidence of political and economic events soon altered the situation.

The Current

The Case for the Producers

Robert M. Hardy, president of Sunshine Mining Co., outlined the argument for the producers before a meeting of the Mining Club late last month. Mr. Hardy amplified the already stated position of the miners (see AMC resolutions below) by noting that the mining industry had requested the Treasury to begin increasing the price gradually more than a year ago. "The authority of the Treasury is permissive and the fixing of the price is discretionary," he said, and noted that a stroke of the pen would remove an "illogical and artificial situation."

Hardy's argument was that if the price had been permitted to rise when would already be on the increase and demand increased, then silver output

Debate • 1867 • 1900

For the next twenty years, a hot controversy raged over the merits (or lack of merit) of international bimetallism. A series of international conferences in the last half of the last century brought no agreement. The U.S. and France were strongly in favor of a double standard; England and Germany were just as strongly against it. By the end of the century, the U.S. had passed two acts—the Bland-Allison Act, 1878, and the Sherman Act, 1890—requiring the Treasury to make monthly silver purchases (460-million oz in 15 years) to support the falling silver price, but to little avail. By 1893 India had removed herself from the silver standard, and the repeal of the Sherman Act that same year removed all support from the metal's price.

The depression of the 90's and the 30-year commodity slump led to feverish agitation for inflationary measures. In the U.S. there was strong support for the adoption of national bimetallism and the free coinage of silver at a ratio of 16 to 1. William Jennings Bryan, in his famous "cross of gold" oration, assumed the leadership of this group, and with the backing of the Democratic and Populist parties, went on to defeat in the Presidential election of 1896. The gold standard was explicitly confirmed by the Act of March 14, 1900.

During and immediately following World War I, the price of silver rose, for a time, to former levels, but in the 20's the troublesome silver price again plummeted, reaching an all time low by February 1931 (12d per oz, 0.925 fine, London; 25¾¢ per oz, 0.999 fine, N.Y.). The Great Depression of the 30's was attributed by some to an insufficiency of gold, and once again the shuffle was on to remonetize silver. In the U.S., the efforts of the powerful western silver bloc, headed by Nevada's Senator Key Pittman, supported by the inflationists, produced far-reaching effects. Many unsound schemes were put forth— but the net result was Roosevelt's attempt to appease the silver producers with price supports.

The Silver Purchase Act of 1934 provided for the purchase of silver until it should make up one-quarter of the total monetary stock of gold and silver together so long as the price did not exceed $1.29 per fine oz. From 1933 to 1942, the Government bought 2.7-billion oz, but still never made the required one-quarter of total, as specified.

When China finally abandoned the silver standard in 1935, bimetallism did indeed seem to be gasping its last. The increased demand for silver for industrial uses during World War II and after, stimulated legislation in this country to permit the Treasury to sell or lease its surplus stocks of the metal for this purpose.

SILVER was a burning issue when this cartoon lampooned its foremost champion, Wm. Jennings Bryan. The paper in his hand reads: "Wheat and Silver — indissolubly linked."

PUCK, New York, September 8, 1897.

Debate • 1961

coming upheaval forecast by the producers would be eased.

With the depletion of free stocks, Hardy pointed out, "About 50-million oz. which are not readily visible, will be required to supply industry in 1962.

"When the Treasury can no longer sell by reason of exhaustion of available stocks, a source of 50-million oz a year must be found promptly if the situation is not to go out of control," he said.

The following resolution pertaining to silver was adopted by the American Mining Congress at the 1961 convention in Seattle:

Although the monetary usage of silver in the Northern Hemisphere is limited largely to subsidiary coinage, it has historically been the paramount metal of money in the Southern Hemisphere and in Asia, and has played a significant role in two world wars, both as a monetary and as a strategic metal.

The rising demand for silver in industry, and its increasing significance in a space-age technology, give importance to increased production of new silver and to the maintenance of strategic reserves of silver. The monetary reserve of the United States is the last major supply of silver in the world and this reserve must not be dissipated.

To encourage the production of new silver and the maintenance of substantial silver reserves, we urge that Congress and the Treasury act to:

1. Discontinue sales of Treasury silver at less than the monetary value.
2. Restore a free market for silver for both spot and future trading through repeal of the tax on silver transactions.
3. Continue to acquire silver for monetary and strategic purposes, in accordance with established public policy and at prices conforming to free market indications.
4. Hold for monetary and strategic use all present stocks and future acquisitions of silver.

The Case of the Silver Users[1]

What the silver users want:

1. A free silver market through repeal of:

The Silver Purchase Act of 1934. (ch. 674, 48 Stat. 1178)
Section 4 of the Act of July 6, 1939 (ch. 260, 53 Stat. 998)
Act of July 31, 1946 (ch. 718, 60 Stat. 750)

[1] Statement on Silver by Rear Admiral Donald J. Ramsey, Legislative Counsel, Silver Users Association, at the Treasury Department on October 17, 1961.

Why they want repeal:
Stipulations in the various acts and proclamations required the Treasury to purchase the following quantities of silver:

Act of 1934	2,000,000,000 oz.
Act of 1939	206,000,000
Act of 1946	376,000,000
By Presidential proclamations during period 1933-1939	301,000,000
Nationalization of silver in U.S. by Presidential direction since 1933	113,000,000
Approximate total taken off the free market	2,996,000,000 oz.

At times when world silver prices exceeded the Treasury price, industry has purchased silver from Treasury free stocks. This occurred intermittently since 1955. (See Handy & Harman chart p 86). Approximately 105-million oz of the 376-million oz taken off the market were purchased by industry during the post 1946 period.

2. Remaining free silver should be sold to industry, as a concession for the billions of ounces that have been removed from the market.

3. The legal requirement of silver backing for $1 and $2 silver certificates should be removed, so that Federal Reserve notes can be substituted. (All other denominations of silver certificates can be replaced by Federal Reserve notes under current laws.) Current circulation consists of about $27.5-billion in Federal Reserve notes, and $2-billion in silver certificates.

4. The Treasury should exercise its prerogative of drawing on its 2-billion oz stock of monetized silver for minting silver coinage instead of using its free silver stocks for coinage or to bid on the open market for 40 to 45-million oz required each year. Silver users contend that if the Treasury will announce a policy of continuing to sell free silver, and use monetized silver for subsidiary coinage, such action will go a long way to prevent speculation and violent action in the market.

5. Repeal of the Silver Act of 1934 will also include repeal of the Silver Transfer Tax which now precludes the establishment of a commodity market for silver in the U.S.

6. The Treasury should not be influenced by speculators in its actions. A spokesman for the silver users said "We cannot believe that the Treasury will arbitrarily take action which will result in a higher price for silver in order to extricate the speculators from the position in which they now find themselves."

7. The Treasury should not increase its selling price to a price based on the London silver market. Silver users contend that the price is set by London bullion brokers and is thus subject to control. They say "It would be highly improper, to say the least, for the Treasury to attempt to set the market price in this manner. The speculative interest in the London market is reported to be very heavy."

Chronology of a Crisis

Higher silver prices needed. "As against a total demand of 250-million to 300-million oz, new world mine production of silver is only slightly more than 200 oz. This is well below the level of silver production prevailing prior to World War II. The situation shown in the reports by the Bureau of the Mint is not likely to be reversed soon because at current prices for silver, an increase in world mine production of any magnitude is unlikely.

"The United States Treasury has the right to sell silver from its free stocks at a minimum price of 91¢ an oz. However, if it continues to exercise this right—which is discretionary and not obligatory—its free stocks may be completely exhausted in a relatively short time, and with the present trends of consumption and production a sharp rise in the price of silver would ensue thereafter.

"For this reason the Treasury Department should re-examine its position to ascertain whether a change in selling policy may not be advisable."

Statement by Simon Strauss,
vice president,
American Smelting and Refining Co.,
E&MJ METAL & MINERAL MARKETS, *Dec. 24, 1959.*

Silver trading off to a good start. "Trading in silver futures on the Canadian Stock Exchange in Montreal, which began last Friday morning, has gotten off to a good start. On the first day, 14 contracts (about 140,000 oz) were traded. This consisted of metal for May, July and September delivery at 93.5¢, 94.25¢ and 95¢ an oz, respectively.

NORTHERN MINER, *February 1961*

No shortage of silver for industry. Handy & Harman believes emphatically that silver will continue to be available in the future as in the past for the requirements of industry. . . . Historically, there have always been secondary sources of silver available at different price levels. The real question about the future of silver is one of price. In time Treasury silver will no longer be available, and Handy & Harman believes that higher price levels can be expected, but most definitely does not believe that the price will go anywhere near as high as the monetary one of $1.29 per oz. The Silver Users Association has for years been advocating establishment of a free market for silver through repeal of all existing silver legislation. It believes, however, that so long as the Treasury is required by law to buy silver, it should continue its present selling policies. Handy & Harman endorses this position.

Press release, July 1961.

The growing silver deficit. During the past 10 years Free World Mine production has totalled about 2-billion oz. During the same period arts and industry have used about 1.9-billion oz. About 800-million oz was used in coinage. The deficiency of silver for the 10-year period is therefore about 700-million oz or about 70-million oz per year. The deficiency during the last two years was in excess of 100-million oz per year.

Robert Hardy, Jr., president
Sunshine Mining Co.
Idaho Mining Assn., Sun Valley, July 6, 1961

A private raid. "Any proposal that the Treasury continue selling down its silver bullion holdings (cost value and/or monetized) to domestic users below world prices constitutes a private raid on the United States Treasury. Such action, if extended, and occurring at a time when the dollar is vulnerable to recurring attack from abroad, psychologically could lead to a more general mistrust in the currency as a stable medium of either domestic or international exchange value. By retention of its present silver bullion reserves and by resumption of purchase of domestic silver for coinage requirements at a world price, the Treasury would insure its large seniorage profits and stimulate domestic production and employment for a relatively small annual outlay."

Donald B. Macurda,
F. S. Smithers & Co.
at American Mining Congress, Seattle, Wash.
Sept. 12, 1961

Treasury Hearings: As part of its current study of the over-all silver situation, the Treasury Department held an informal hearing Oct. 16. Robert V. Roosa, Under Secretary for Monetary Affairs, presided.

Spokesmen for domestic silver producers and consumers presented their views at the hearing, the transcript of which will not be made public.

Earlier this month Treasury Secretary Dillon established, in the office of the Under Secretary for Moentary Affairs, an Office of Domestic Gold and Silver Operations. This office will handle policy matters previously as-

Futures Trading on Canadian Stock Exchange Reflects Upward Pressure on World Silver Prices

Date	Number of Contracts	Ounces	Price	Delivery Date
Feb. 28-Mar. 6..	4	10,000	95¢	Sept. 1961
		30,000	95.8¢	Nov. 1961
Mar. 7-13.....	2	10,000	93.25¢	May 1961
		10,000	96.5¢	Jan. 1962
Mar. 14-20	1	10,000	93.5¢	July 1961
Mar. 28-Apr. 3 ..	4	10,000	97¢	Jan. 1962
Apr. 11-17	5	10,000	92.75	May 1961
		10,000	93.65	July 1961
		10,000	94.75	Sept. 1961
		10,000	95.25	Nov. 1961
		10,000	96.10	Jan. 1962
Apr. 18-24	3	10,000	95.5	Jan. 1962
		20,000	97¢	Mar. 1962
Apr. 25-May 1....	2	10,000	94.5	Nov. 1961
		10,000	94.25	Nov. 1961
May 2-8.....	1	10,000	92¢	July 1961
May 30-June 5 ..	1	10,000	93¢	July 1961
June 20-26	9	10,000	90.75	Jan. 1962
June 25-July 3 ..	2	10,000	93¢	July 1961
		10,000	96.5¢	Mar. 1962
July 4-10	1	10,000	97.5	Nov. 1961
July 11-17.....	9	10,000	99.25-99.95¢	May 1962
July 18-24	11	10,000	95.75¢	July 1961
July 25-31	8	10,000	96.25	Nov. 1961
		10,000	100.5	Mar. 1962
		60,000	100.25-100.5¢	May 1962
Aug. 1-7	—	—	—	—
Aug. 8-14	7	10,000	95.75	Sept. 1961
		10,000	96.50	Mar. 1962
		10,000	$1.0175	Mar. 1962
		40,000	99.25¢-$1.018	May 1962
Aug. 15-21	7	10,000	96¢	Sept. 1961
		10,000	$1.02	Mar. 1962
		50,000	99.25-$1.0275	May 1962
Aug. 22-28	3	10,000	$1.0275	May 1962
Sept. 5-11.....	15	10,000	97¢	Nov. 1961
		10,000	$1.0125	May 1962
		130,000	$1.03	July 1962
Sept. 12-18.....	3	10,000	97¢	Nov. 1961
		10,000	$1.015	May 1962
Sept. 19-25.....	3	10,000	98¢	Nov. 1961
		20,000	99.5¢	Jan. 1962
Sept. 26-Oct. 3..	37	80,000	$1.0175	Mar. 1962
		130,000	$1.02	Mar. 1962
		90,000	$1.0225	Mar. 1962
		20,000	$1.02	May 1962
		50,000	$1.025	May 1962
Oct. 4-5	6	30,000	$1.025	July 1962
		10,000	$1.0225	July 1962
		10,000	$1.02	July 1962
		10,000	97.5¢	Nov. 1961

Futures trading on Canadian Stock Exchange in Montreal started on Monday 20, 1961. Data as reported in THE NORTHERN MINER.

signed to the Bureau of the Mint.

American Mining Congress Newsletter Oct. 20, 1961

The situation today. "By late October, Treasury free stocks of silver were under 50-million oz and will drop to 25-million by year-end." There will be a demand for 50-million oz per year to replace the flow which has been coming from free stocks once they are exhausted, and those 50-million are not now visible. (See p 93)

The newest impact on the market and its future is the cessation of silver sales in London by the Red Chinese, who sold 4.4-million oz last year and 25-million oz in the first two quarters of 1961. No one knows why the Chinese halted sales, but one assumption is that they are awaiting a higher price, combined with the excellent possibility that the Reds are not averse to an embarrassment among capitalist markets.

The silver users (see p 93) do not wish the Treasury to stop selling free stocks, and "believes emphatically that there will not be a shortage of silver for future industrial uses." F. H. Wemple feels that the price will not rise $1.10 per oz, even when free stocks are exhausted.

From a disscussion by Robert M. Hardy, Sunshine, and F. H. Wemple, Handy & Harman, Mining Club of New York Oct. 25, 1961

Industrial Uses of Silver

Industrial consumption of silver in the U.S. and Free World was reported as follows by the Director of the Mint, U.S. Treasury Department, June 1961, in millions of fine ounces:

Year	U.S.	Free World ex. U.S.	Total Free World
1920	19.3		
1930	26.9		
1940	44.5		
1949	88.0	44.5	132.5
1950	110.0	47.4	157.4
1951	105.0	60.0	165.0
1952	96.5	45.6	142.1
1953	106.0	62.3	168.3
1954	86.0	74.8	160.8
1955	101.4	91.4	192.8
1956	100.0	115.9	215.9
1957	95.4	117.2	212.6
1958	85.5	105.0	190.5
1959	101.0	113.8	214.8
1960	100.0*	126.0	226.0

*Preliminary

The use of silver in arts and industry has expanded more rapidly outside the U.S. because of the accelerated expansion in Germany and Japan.

A breakdown of U.S. industrial uses of silver in millions of ounces troy was estimated as follows by Ralph Wilcox of Asarco in early 1959:

Photography	28 to 32
Solder and brazing	24 to 27
Electrical contacts	18 to 20
Ceramic uses	1 to 1.3
Batteries	1.5

Wilcox said that about 90% of the silver used in color film is recovered, while only about 50% of the silver is recovered in processing black and white film. Silver solders are used in refrigeration, air conditioning, automotive and electrical appliance industries. Newer applications are jets and rockets where high temperature assemblies are required. One special high-temperature solder contains 92.5% silver and 7.5% copper. Nearly all electrical appliances require silver plating, pure silver or silver alloys on contact surface. Rapid growth of the electronics industry assured a growing market for silver in this field.

Silver-zinc and silver-cadmium batteries are finding increasing application in portable equipment where long life and re-chargeability are required. Other uses for silver include catalysts, water purification and sterilization, aircraft and diesel engine bearings, desalting of sea water, and fungicides.

The following table of total silver consumption in Canada reveals the relative quantities used in industry and the arts: (millions oz)

	1959	1960
Coinage	5.74	7.48
Silverware	1.51	1.65
Photography	1.38	1.41
Wire and Rod	.021	.046
Brazing and Alloys	.140	.130
Miscellaneous	1.41	1.03
	10.201	11.746

Weight and Value of Silver in Selected World Coins Corresponding to Various Possible Prices for Silver per Troy Oz[1]

Country	Coin	Wt. Grams	Percent Silver	Silver Grams	Content Oz Troy	Value of Silver Content @ 91.375¢	$1.00	$1.10	$1.2929	Value of Coin in Dollars October 13, 1961	Rate of Exchange
United States	Dollar	26.73	90.0	24.057	.77464	.7078	.7746	.8521	1.00	1.00	———
	50¢*	12.5	90.0	11.25	.36225	.331	.362	.398	.4683	.50	———
	25¢*	6.25	90.0	5.625	.18113	.1655	.181	.199	.2342	.25	———
	10¢*	2.5	90.0	2.25	.07245	.0662	.0723	.0796	.0937	.10	———
United Kingdom	Crown (5 s.)	28.2759	50.0	14.138	.4552	.4159	.4552	.5007	.5885	.705	£/2.8156
	Half Crown (2½ s)	14.13795	50.0	7.069	.2276	.2080	.2276	.2504	.2942	.3525	£/2.8156
	Florin (2 s.)	11.31036	50.0	5.655	.1821	.1664	.1821	.2003	.2354	.2820	£/2.8156
	Shilling	5.65518	50.0	2.8276	.0910	.0832	.0910	.1001	.1176	.1410	£/2.8156
	Sixpence	2.82759	50.0	1.4138	.0455	.0416	.0455	.0500	.0588	.0705	£/2.8156
Canada	Dollar*	23.3276	80.0	18.662	.599	.5473	.5990	.6589	.7744	.97125	Dollar/97.125
	50¢*	11.6638	80.0	9.331	.300	.2741	.300	.33	.388	.48562	Dollar/97.125
	25¢*	5.8319	80.0	4.6655	.150	.1371	.150	.165	.1939	.24281	Dollar/97.125
	10¢*	2.3328	80.0	1.8662	.0601	.0549	.0601	.0661	.0777	.09713	Dollar/97.125
Australia	Florin* (2 sh.)	11.31036	50.0	5.655	.1821	.1663	.1821	.200	.274	.225	£/2.25¼
	Shilling	5.65518	50.0	2.828	.09106	.0832	.0911	.100	.1176	.1126	£/2.25¼
Austria	50 Sch.*	20.00	90.0	18.00	.5796	.5296	.5796	.6376	.7494	1.95	Schilling/.0389
	25 Sch.*	13.00	80.0	10.40	.3349	.306	.3349	.368	.433	.973	Schilling/.0389
Belgium	100 Francs	18.0	83.5	15.03	.4840	.4423	.4840	.5324	.6258	2.05	Franc/.0205
	50 Francs	12.5	83.5	10.044	.3234	.2955	.3234	.3557	.4181	1.025	Franc/.0205
	20 Francs	8.0	83.5	6.68	.2151	.1965	.2151	.2366	.2781	.41	Franc/.0205
Colombia	1 Peso	25.0	90.0	22.50	.7245	.6620	.7245	.7970	.9367	.1175	Peso/.1175
Denmark	2 Kroner	15.0	80.0	12.00	.3864	.3530	.3864	.4250	.4996	.2930	Krone/.1465
Egypt	10 Piastres	7.0	72.0	5.04	.1616	.1477	.1616	.1778	.2089	.195	£/1.95
France	5 Francs*	12.0	83.5	10.02	.3226	.2948	.3226	.3549	.4171	1.0175	Franc/.2035
Germany	D. M.*	11.2	62.5	7.00	.2254	.206	.2254	.2479	.2914	.2510	Mark/.2510
India	1 Rupee	11.6638	50.0	5.832	.1878	.1716	.1878	.2066	.2428	.2112	Rupee/.2112
Iraq	100 Fils	10.0	90.0	9.0	.2898	.2648	.2898	.3188	.3747	.28275	Dinar/2.8275
	100 Fils*	10.0	50.0	5.0	.161	.147	.161	.1771	.2081	.28275	Dinar/2.8275
	50 Fils*	9.0	50.0	4.5	.1449	.1324	.1449	.1594	.1873	.14138	Dinar/2.8275
Italy	500 Lire*	11.0	83.5	9.185	.296	.271	.296	.326	.383	.8075	Lira/.001615
Japan	100 Yen*	4.8	60.0	2.88	.092736	.08473	.093	.102	.120	.28	Yen/.0028
Mexico	10 Pesos	28.88	90.0	25.992	.8369	.7647	.8369	.9206	1.082	.802	Peso/.0802
	5 Pesos*	18.055	72.0	13.00	.4186	.3825	.4186	.4605	.5412	.401	Peso/.0802
	5 Pesos	27.778	72.0	20.00	.644	.5885	.644	.7084	.8327	.401	Peso/.0802
	1 Peso*	16.0	10.0	1.6	.0515	.0471	.0515	.0567	.0666	.0802	Peso/.0802
	1 Peso	13.33	30.0	4.0	.1288	.1177	.1288	.1417	.1665	.0802	Peso/.0802
Netherlands	2½ Guilder*	15.00	72.0	10.80	.3478	.3178	.3478	.3826	.4497	.6939	Guilder/.27755
Philippines	1 Peso	20.00	80.0	16.0	.5152	.4708	.5152	.5667	.6661	.2525	Peso/.2525
	50 Centavo	10.00	75.0	7.5	.2415	.2207	.2415	.2657	.3122	.1263	Peso/.2525
Portugal	20 Escudos	21.0	80.0	16.8	.541	.4943	.541	.5951	.6995	.7030	Escudo/.03515
	10 Escudos*	12.5	68.0	8.50	.2737	.2501	.2737	.3011	.3539	.35155	Escudo/.03515
	10 Escudos	12.5	83.5	10.44	.3361	.3071	.3361	.3697	.4345	.35155	Escudo/.03515
	5 Escudos	7.0	65.0	4.55	.1465	.1339	.1465	.1612	.1894	.1758	Escudo/.03515
Saudi Arabia	1 Ryal	11.6638	91.67	10.692	.3443	.3146	.3443	.3787	.4451	———	Not quoted
Sweden	5 Kronor	25.0	90.0	22.50	.7245	.6620	.7245	.7970	.9367	.96875	Krona/.19375
	5 Kronor*	18.0	40.0	7.2	.2318	.2118	.2318	.2550	.2997	.96875	Krona/.19375
	2 Kronor	15.0	80.0	12.0	.3864	.3531	.3864	.4250	.4996	.3875	Krona/.19375
	2 Kronor*	14.0	40.0	5.6	.1803	.16475	.1803	.1983	.2331	.3875	Krona/.19375
	1 Kronor	7.5	80.0	6.0	.1932	.1765	.1932	.2125	.2498	.19375	Krona/.19375
	1 Kronor*	7.0	40.0	2.8	.0902	.0824	.0902	.099	.1166	.19375	Krona/.19375
Switzerland	2 Francs*	10.0	83.5	8.35	.2689	.2457	.2689	.2958	.3477	.4070	Franc/.2035
	1 Franc*	5.0	83.5	4.175	.1344	.1228	.1344	.1478	.1738	.2035	Franc/.2035
Turkey	1 Lira	7.5	60.0	4.5	.1449	.1324	.1449	.1594	.1873	.0875	Lira/.0875
	25 Kurus	4.0	60.0	2.4	.0773	.0706	.0773	.085	.0994	.0219	Lira/.0875
Uruguay	1 Peso	9.0	72.0	6.48	.2087	.1907	.2087	.2296	.2698	.0930	Peso/.0930
	50 Centesimos	7.0	72.0	5.04	.1623	.1483	.1623	.1785	.2098	.0465	Peso/.0930
Venezuela	5 Bolivares	25.0	90.0	22.5	.7245	.6620	.7245	.7970	.9367	1.095	Bolivar/.2190
	1 Bolivares	5.0	83.5	41.75	.1344	.1228	.1344	.1478	.1738	.2190	Bolivar/.2190

[1] Value of coins is based on silver content in oz troy expressed in dollars for current and possible future market value of silver. Value of foreign exchange is variable. Exchange rates above expressed in dollars are based on currency exchange rate published in the New York Times and the Wall Street Journal during the period October 13 to 17, 1961.

* These coins were minted in 1959, all others were not. Content of silver in coins, and coins minted in 1959 as reported in the Report of the Director of the Mint for Fiscal 1960, published January 3, 1961

Silver in World Coinage

Silver consumed in world coinage is reported as follows in millions of fine ounces by the U.S. Treasury:

1950....	44.1	1955....	53.1
1951....	90.5	1956....	56.7
1952....	114.3	1957....	84.3
1953....	90.7	1958....	79.4
1954....	83.4	1959....	85.8

Silver consumed in the U.S. silver coinage was reported as follows by the Director of the Mint, June 1961:

Year	Face value millions $	Silver content millions fine oz.
1920.....	25.1	18.13
1930.....	2.7	1.92
1940.....	29.4	21.24
1941.....	76.1	55.06
1942.....	102.1	73.82
1943.....	105.8	76.51
1944.....	90.8	65.67
1945.....	75.9	54.88
1946.....	61.0	44.12
1947.....	35.3	25.55
1948.....	36.9	26.66
1949.....	18.7	13.49
1950.....	34.0	24.60
1951.....	61.4	44.44
1952.....	79.3	57.34
1953.....	59.1	42.76
1954.....	73.6	53.20
1955.....	11.4	8.25
1956.....	43.4	31.37
1957.....	72.1	52.13
1958.....	52.7	38.13
1959.....	57.3	41.44
1960.....	63.7	46.05

Reference to the accompanying table on major consumers of silver in coins will show that the U.S. is largely responsible for the total of silver used. Increased consumption is dictated by an increase in the total volume of currency in circulation spurred by inflation and growing popularity of coin-operated vending machines, rather than any switch to silver as a monetary metal.

In some respects silver seems to be slipping. During 1959 the following major countries minted no coins at all containing silver: Argentina, Belgium, Boliva, Brazil, Chile, Republic of China, Colombia, Denmark, Ecuador, Honduras, India, Indonesia, Ireland, Morocco, Nepal, New Zealand, Norway, Pakistan, Paraguay, Peru, Philippines, Rhodesia, Saudi Arabia, Turkey, United Kingdom, Uruguay and Venezuela.

The case of Great Britain, core of the Sterling Bloc, is most surprising. Although six United Kingdom silver-containing coins are listed among those in circulation in the U.S. Treasury Report for 1959, not one was minted in 1959. Substantial quantities of copper-nickel coins of equivalent value were minted as a substitute for silver-bearing half crowns, florins, shillings, sixpence, and threepence. There is no apparent reluctance among Britons to accept copper-nickel coins in lieu of silver coins. Also significant is the relatively large amount of silver coinage withdrawn from active circulation. During the 1956-59 period silver withdrawn by United Kingdom in successive years was as follows in millions of ounces: 15.7, 12.3, 9.7, and 7.9. During the same period the U.S. only withdrew the following quantities (millions of ounces): 1.6, 1.3, 1.7 and 1.3.

The Melting Point of Silver

Some concern has been expressed that if the price of silver should rise to $1.10 or even $1.29 per oz, silver-bearing coins would be melted down for their silver content. The accompanying table of silver content in selected world coins was prepared to test this assumption, and reference to the table will reveal that very few coins are being minted today that will be worth melting, even if silver does rise to $1.29 per oz. Of course, many older coins, no longer being minted, such as the Colombian peso, the Denmark 2-kroner piece, the Iraqi 100-fil piece, older Mexican 5- and 10-peso coins, the Philippine peso, and the Uruguay peso would be worth collecting if world silver prices should rise sharply.

Many countries have anticipated the melt-down point for coins, and are withdrawing older high-silver coins and minting new ones with lower silver content. Thus we note Australia is now minting florins, shillings, sixpence and threepence pieces containing only 50% silver instead of 92.5% in earlier coins in circulation. In Canada the following coins formerly contained 92.5% silver; dollar, 50¢ 25¢ and 10¢. Now they are being minted with only 80% silver content. Note in the coinage table that the price of silver would have to go considerably above $1.29 to warrant the melting down of the Canadian silver coins now being minted.

The French coinage program is significant. Here some 12.2-million oz of silver were used to mint new 5-franc pieces during 1960. A new two-franc piece has been authorized but not yet minted.

In Canada, U.S. subsidiary coinage was circulated freely. But with a switch in the relative value of the U.S. dollar with respect to the Canadian dollar, the Canadian Government has found it necessary to step up its volume of subsidiary silver coinage. Consumption of silver for coinage in 1960 was 7.5-million oz, 30% more than in 1959.

Consumption of Metals in Coinage of Nations, 1959. (Short Tons)

Gold	67.9
Silver	2,940.2
Nickel	3,735.1
Copper	20,229.5
Zinc	1,048.3
Tin	219.4
Aluminum	1,406.7
Magnesium	11.5
Manganese	0.6
Steel	2,409.4
Others	1,208.8
Total	33,277.4

Source: Annual Report of the Director of the Mint, Jan. 3, 1961.

Note: 2,940.2 short tons of silver is equivalent to 85,753,873 oz. troy.

Major Consumers of Silver in Coinage, 1959 (Short Tons)

United States	1,420.7
Australia	89.5
Austria	106.2
Canada	171.5
France	189.0
Germany	16.1
Iraq	95.2
Italy	196.0
Japan	349.2
Mexico	62.6
Netherlands	85.7
Sweden	27.0
Switzerland	29.1
United Arab Republic Egyptian Region	38.5

Source: Annual Report of the Director of the Mint, Jan. 3, 1961.

Who Can Buy Treasury Silver

Sales in the New York market are free of any restrictions whenever silver is available from foreign sources at prices below those set by the U. S. Treasury in accordance with the Silver Act of July 31, 1946. This act provides that the Treasury may sell silver held or owned by the United States at a price not less than 90.5¢ per oz troy, and subject to such terms as shall be deemed advisable by the Treasury to promote employment in industry in the U. S.

In accordance with the provisions of the act, the Treasury sells silver at 91¢ per oz troy, San Francisco, which is equivalent to 91⅛¢ delivered, New York.

Whenever silver is unavailable at prices below this level, manufacturers apply to the Mint for silver. In accordance with the provisions of the Act of 1946, the Mint requires that all purchasers of silver, or their authorized representatives, fill out an "End Use" certificate which stipulates:

1. That the silver is needed by the

purchaser for the customary and ordinary conduct of his business.

2. That this amount of silver, together with other silver held by the purchaser, which has not entered into the process of manufacture does not exceed the amount of silver used in any two consecutive calendar months during the year preceding the date of the certificate, in the ordinary conduct of the purchaser's business.

3. That the silver will be processed or otherwise fabricated by the purchaser in a manner to be stipulated on the certificate.

4. That none of the silver will be resold or exported by the purchaser in the form in which it is acquired.

Thus foreign governments or companies, or U.S. parties who do not process silver cannot buy Treasury silver, nor can silver be purchased for speculation or export. Because of the free availability of silver to qualified manufacturers, the New York price of 91⅝¢, delivered, is regarded as the going quotation. Silver is available to foreign purchasers and domestic buyers not qualified to buy Treasury silver at prices other than the prevailing New York quotation. But these prices are not available or reported in publications carrying market quotations. During the first seven months of 1961, the Royal Canadian Mint is reported by THE NORTHERN MINER to have purchased 4.5-million oz of coinage silver in the U.S., of which 3.5-million oz was purchased at prices 1 to 3¢ above the 91¢ Treasury base price.

Who Buys Treasury Silver

U.S. Treasury sales of silver during July 1961 totalled 3,081,000 oz. July buyers included the following:

Eastman Kodak Co.	500,764 oz
Engelhard Industries	450,479
Goldsmith Bros.	350,630
Gorham Mfg. Co.	400,507
Handy & Harman	900,069
Mallory Metallurgical	75,629
Ames Chem. Works	400,586
M. Hannum Refining	2,277

Silver as a By-product

Only a small percentage of silver produced today comes from mines which can be classified as strictly silver mines. Most of the production is a by-product or co-product of base metal ores. And since silver is essentially a by-product, future production will be stimulated more by demand and increased production of base metals than it will be by higher silver prices.

The proportion of silver to other base metals in ores is indicated roughly by the following production and reserve figures of companies with integrated production from many sources:

The Silver In Your Pocket

Each of us is carrying a testament of the role of silver in U.S. commercial life. If you haven't ever noticed before, the legend on the bottom of the singles in your pocket reads "One dollar in silver payable to the bearer on demand."

And incidentally, insiders in the silver business have for years been collecting wartime nickels, in which scarce nickel was replaced by silver. The nickels (distinguished by a mint mark above the dome of Jefferson's Monticello) are already worth more than 5¢ in silver content and we're told that collectors will pay a premium for them if in mint condition.

Production from foreign and domestic mines and mills of American Smelting and Refining Co. for 1960 was reported as follows:

Tons ore mined	5,292,768
Gold, oz	28,270
Silver, oz	11,706,526
Lead, tons	86,335
Copper, tons	41,535
Zinc, tons	159,743

Metal production from leased, company and purchased ores at the Peruvian operations of Cerro Corp. for 1960 was reported as follows:

Copper	36,795 tons
Lead	79,943 tons
Zinc	35,156 tons
Silver	14,964,000 oz
Gold	42,000 oz

Fresnillo Co. estimated that the ore reserves at the Fresnillo, Plateros and Naica mines in Mexico as of June 1960 were as follows:

Tons ore	5,374,100
Gold, oz/ton	0.017
Silver, oz/ton	6.1
Lead, percent	5.3
Zinc, percent	5.2
Copper, percent	0.39

Of the record silver output of 33,759,454 oz in Canada in1960, 47% came from lead-zinc and silver-lead-zinc ores, chiefly from British Colombia and Yukon Territories; 33% came from copper, copper-zinc, and nickel-copper ores; 18% from silver-cobalt ores of Northern Ontario and 2% from lode and placer operations.

World Reserves of Silver

Mineral facts and problems, 1960 Edition, published by the U.S. Bureau of Mines estimates that world reserves of recoverable silver are of the order of 5-billion oz. Latest estimates of U.S. reserves (January 1944) of measured, indicated and inferred reserves of recoverable silver totalled 763.4-million oz, or about 18% of the recorded domestic production. Distribution of the reserves in millions of ounces is as follows:

Alaska	2	Central States	5.5
Arizona	100	New Mexico	13
California	40	Oregon	1
Colorado	100	South Dakota	2.2
Idaho	225	Utah	120
Montana	105	Washington	3
Nevada	45	Eastern States	1.7

Since bonanza deposits have been largely depleted, estimated reserves consist chiefly of coproduct silver in lead-zinc mines, and by-product silver in copper mines.

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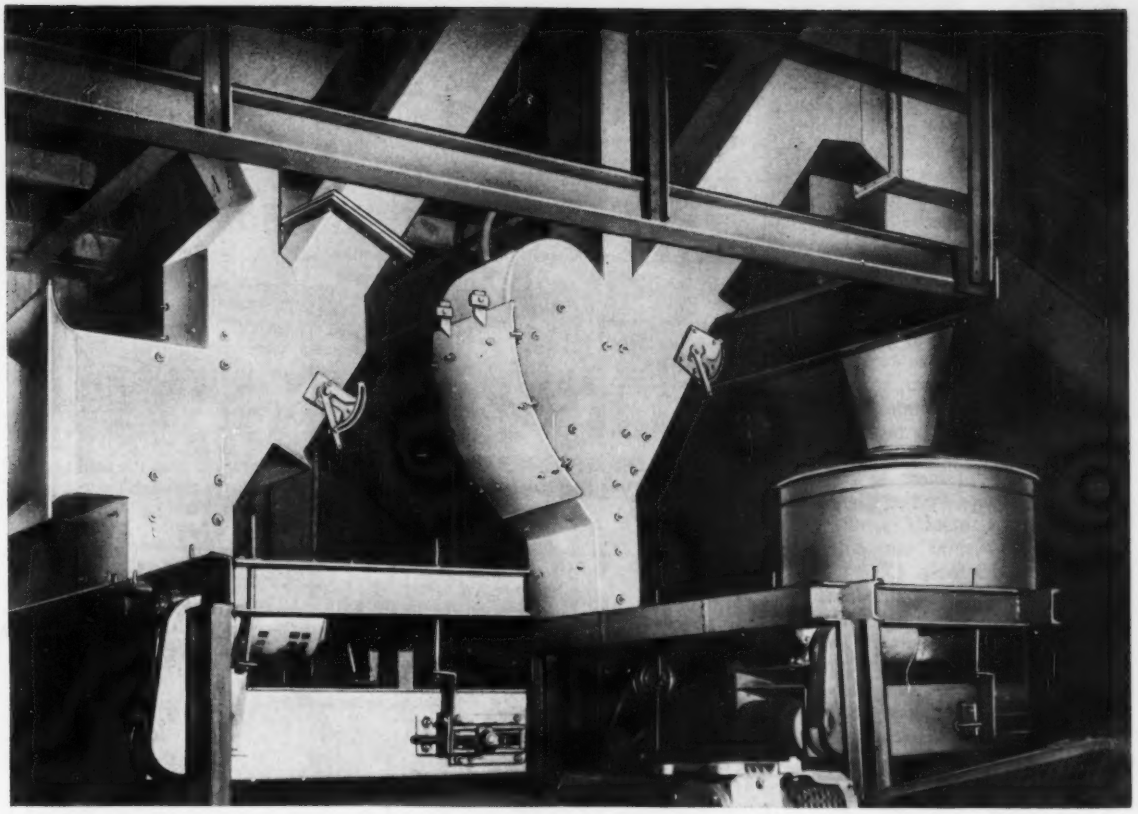


1. BY CLASSIFYING zinc-furnace residues in front of the magnetic separators, American Zinc gets vastly better separation. Gravitational classifier is at left and gravitational-inertial unit in the center. The cyclone (upper right) separates fine particles from the air stream following the classification process at the company's Dumas, Texas, operation.

Air Classifiers Increase Recovery of By-Products From Smelter Residues

THE AMERICAN ZINC COMPANY of Illinois, Dumas, Texas, has upgraded both the magnetic concentrate and the non-magnetic concentrate of its zinc-furnace residue by passing the minus 3-mesh fraction through two pneumatic classifiers operating in series, using the same airstream. The coarse fraction obtained in each case is passed through permanent magnet type separators which separate magnetic iron-gold-silver-copper concentrate from non-magnetic material rich in zinc and carbon. Recoveries of all elements were increased by this installation.

Formerly, the residue was separated without being classified, with the result that separation was not complete because an insufficient number of iron-bearing particles were subjected to the magnetic force, and because non-magnetic material was entrapped and carried away with the magnetic material.

Plus 3-mesh residue is removed by a trommel screen before the classification and subsequent magnetic separation. Minus 3-mesh material is conveyed by bucket elevator and belt conveyor to the new classifying system.

The first classification stage takes place in the Buell Gravitational Classifier, to the left in Fig. 1 and in the drawing (Fig. 2).

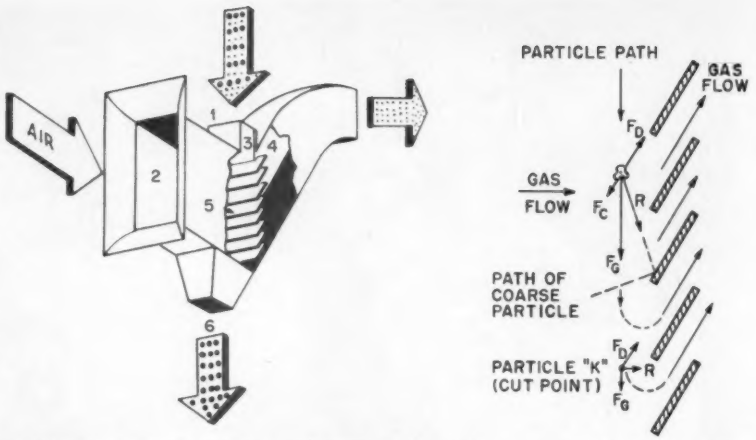
Continuous Feed

With reference to Fig. 2, a continuous curtain of feed material enters the classifier at the top (1) through a choke feed gate that assures uniform distribution across the width of the classifier. Low velocity air (300 to 600 ft/min) enters the classifier at inlet (2) and is made to flow through the feed curtain (3) which is dropping in front of the air outlet (4) which is provided with widely spaced vanes (5). The air stream enters the feed curtain perpendicularly but is changed to an almost parallel but reverse direction to the feed curtain as it passes through the vanes. The classification takes place as follows:

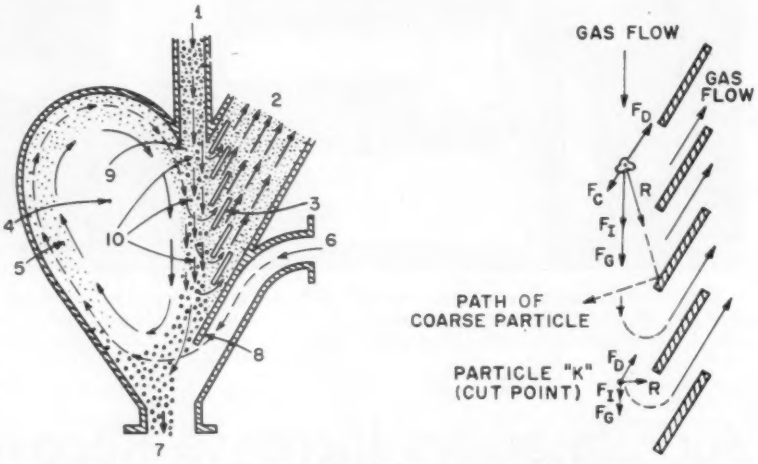
Each particle entering the classifier has acting on it a gravitational force (Fg) proportional to its mass which in turn is proportional to the cube of its diameter. The particle is also subjected to a drag force (Fd) proportional to the square of its diameter, created by the air flow through the feed curtain. As the particle is influenced by the drag force (Fd) and changes direction, it is subjected to a small centrifugal force (Fc) proportional to its mass, directly opposing

drag force (Fd). Under set conditions, the resultant force (R) acting on a particle of diameter (K), referred to as the cut point, will be of a magnitude and direction to give the particle a 50-50 chance of being swept by the gas stream through the vanes or to impinge on the vanes and be thrown back into the feed curtain. The resultant force (R) on particles having diameters larger than (K), is in a direction at small variance with the gravitational force (Fg) and the particles will either impinge on the vanes and be knocked out, or if large enough, they will not even come in contact with the vanes but fall directly into the coarse discharge outlet (6). Smaller particles will have a resultant force (R) almost parallel to the drag force which will permit them to be swept through the vanes by the gas stream.

Buell Gravitational Classifiers separate at any desired cut point between 50 to 10 mesh (297 to 1651 microns). The cut point is controlled by the air velocity through the vanes, determining the magnitude of the drag force (Fd). Velocity is regulated by an air by-pass beyond the classifier, the by-pass providing a means of controlling the amount of air entering the classifier.



2. IN THE GRAVITATIONAL CLASSIFIER, the air stream crosses the feed material and entrains fine particulate matter. Coarse particles discharge through bottom outlet.



3. GRAVITATIONAL-INERTIAL CLASSIFIER takes air-entrained feed through the top. Coarse material drops to bottom outlet, fines exit through inclined duct.

Power Requirements

Power requirements are extremely low as most of the energy loss is due solely to the change of direction of the air stream as it is exhausted through the vanes. The resistance to gas flow or draft loss to effect classification, ranges from 0.5 to 4 in. water gage depending on the cut point and feed to air ratio. The higher the cut point, the higher the draft loss, as the gas flow through the vanes must be increased to provide a high drag force. The volume of gas to feed ratio is normally around 150 to 300 cfm per ton hour of feed.

Coarse residue discharges from the gravitational classifier onto a belt conveyor. This conveyor passes beneath a right-angle conveyor that has the permanent magnets positioned above its lower strand. These magnets draw iron-bearing particles from the aggregate and secure them against the bottom surface of the lower strand of the conveyor. The conveyor transfers the ferrous material to a discharge point at which the magnets are discontinued, and the magnetic concentrate drops onto a take-away conveyor for removal to a storage bin. The less magnetic particles are conveyed to a Stearns drum separator for a second stage of magnetic separation.

The air-entrained material from the first classifier is carried to the second stage unit, the Buell Gravitational-Inertial Classifier (center in Fig. 1, and left in Fig. 3). Here the material is further classified, and the coarse material is discharged onto a conveyor from which magnetic particles are removed as before. The non-magnetic portion joins the coarser stream enroute to the Stearns magnetic separator.

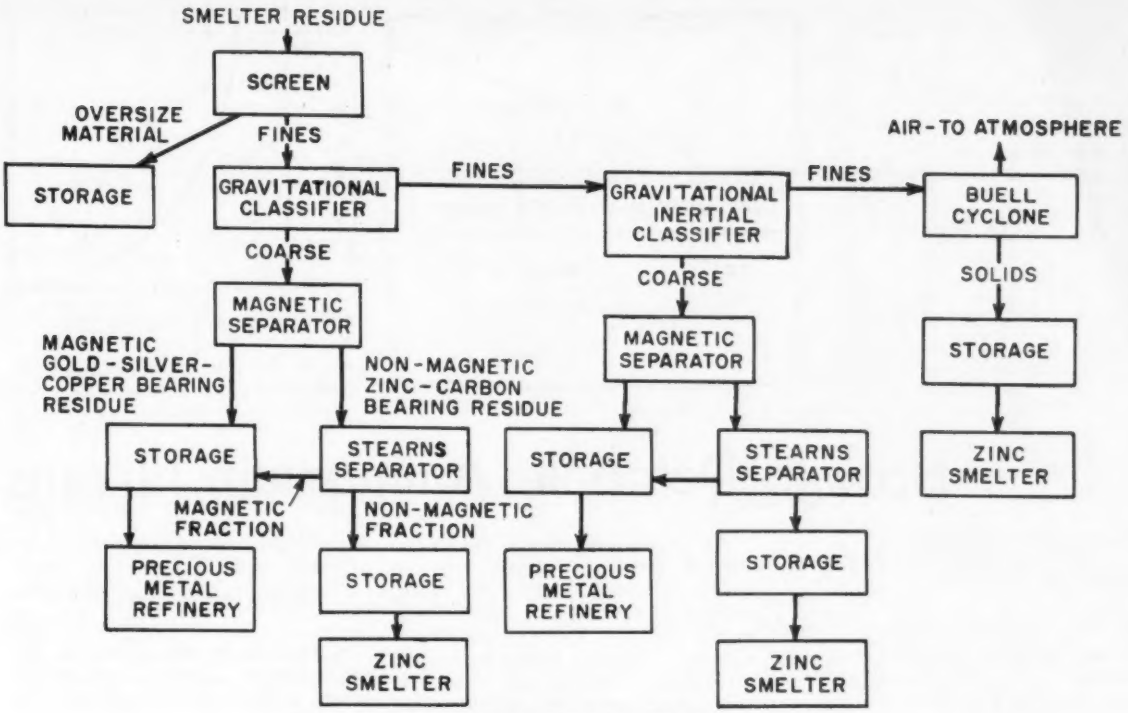
Feed Material

With reference to Fig. 3, air-entrained feed material enters the classifier primary air inlet (1) at the top of the unit. In traveling to the gravitational-inertial unit, the air stream makes a 120° turn within a transition piece designed to accelerate the air flow to meet Gravitational-Inertial air velocity requirements, ranging from 3500 to 6000 ft/min, depending on the classification required in any respective operation.

The curtain of feed material drops in front of the air outlet (2) which is provided with widely spaced vanes (3) to almost reverse the gas flow introduced through the primary air inlet (1). Prior to passing through the vanes, the relatively high velocity of the entering gas stream sets up, by friction, a counter clockwise eddy current (5) in the chamber (4). The eddy current is reinforced by any air admitted through the secondary air inlet (6) located just above the coarse discharge outlet (7).

Gravitational Force

As in the first step (gravitational classifier), each particle entering the gravitational-inertial classifier has a gravitational force (Fg) proportional to its mass which in turn is proportional to the cube of its diameter. Inasmuch as the particle is introduced in the classifier at the velocity of the



How American Zinc Reclaims Furnace Residue

primary air stream, it is also subjected to an inertial force (Fi) also proportional to its mass.

Gas Stream

Since the gas stream flows in a downward direction, the inertial and gravitational forces (Fi and Fg) complement each other. The gas stream changes direction as it passes through the vanes, thus exerting a drag force (Fd) proportional to the diameter of the particle, and almost opposite in direction to the gravitational and inertial forces. As the particle is influenced by the drag force (Fd) and changes direction, it is subjected to a small centrifugal force (Fc) proportional to its mass, directly opposing drag force (Fd). Under set conditions, the resultant force (R) acting on a particular diameter (K) again will be of a magnitude and direction to give the particle a 50-50 chance of being swept by the gas stream through the vanes or to impinge on the vanes and to be thrown back into the feed curtain. The resultant force (R) on particles with diameters larger than (K) is in a direction at small variance with the gravitational-inertial forces and the particles will either impinge on the vanes and be knocked out, or if large enough, they will not even come in contact with the vanes but fall directly into the coarse discharge. Smaller particles will have a resultant force (R) almost perpendicular to the gravitational-inertial forces which will permit them to be swept through the vanes by the gas stream.

The eddy current (5) flowing in a downward parallel direction to the plane formed by the vanes, provides a moving wall containing the curtain of feed material in the classifying zone without detrimental frictional drag effects of a solid wall.

The particles not swept through the vanes fall on an inclined baffle plate (8) located at the bottom of the gas outlet (2) directly underneath the primary gas inlet (1). The coarse product is scrubbed by secondary air, and it slides into the coarse discharge outlet. Any fines adhering to coarser particles are picked up by the secondary air flow to join the stray fine particles entrained by the eddy current and are returned to the classifier inlet at point (9), where they are reintroduced in the classifying zone (10).

Cut Point Controlled

Buell Gravitational-Inertial Classifiers separate at any desired cut point between 200 to 50 mesh (74 to 297 microns). The cut point is controlled by regulating the primary air velocity by varying the flow through the secondary air inlet, while keeping the total air volume (i.e., vane velocity) constant.

The resistance to gas flow or draft loss to effect classification generally ranges from 0.5 in. to 3 in. wg, depending on the cut point and feed to air ratio. The volume of air to feed ratio is normally around 300 cfm per ton hour of classified feed.

Airborne fines from the gravitational-inertial classifier are separated from the air stream by a Buell cyclone dust collector. The cleaned airstream is discharged to atmosphere and the reclaimed dust is sent to the stockpile.

The cyclone fan provides the airflow used throughout the system. Room air is drawn into and through the gravitational unit, to and through the inertial-gravitational classifier, through the cyclone, and exhausted to atmosphere. Internal design of these units causes aerodynamic forces to classify and separate the entrained particles as described.

The gravitational classifier cut point is set at 35 mesh. All coarse material is larger than 35 mesh, except for small traces of fine material. The gravitational-inertial cut point is 100 mesh and 89.4% of the coarse material from this stage is larger than 100 mesh.

The magnetic concentrates are sent to a precious metal refinery if their copper, gold, and silver values are high enough. The non-magnetic fraction is returned to the zinc smelter for utilization of its carbon and zinc values.

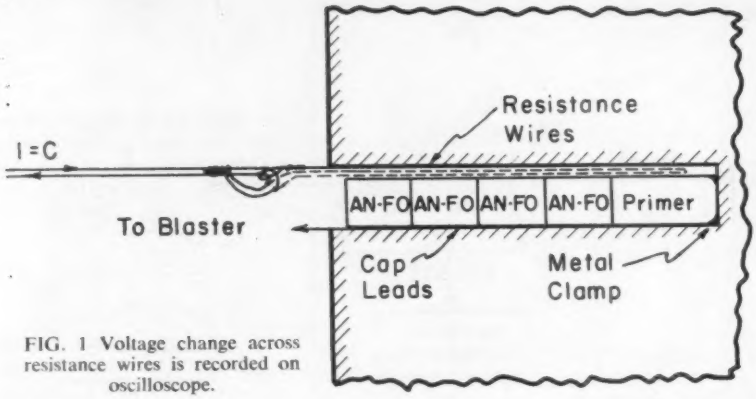


FIG. 1 Voltage change across resistance wires is recorded on oscilloscope.

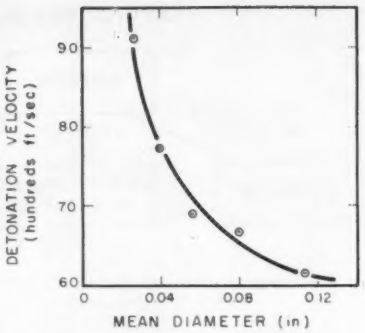


FIG. 2 The detonation velocity is increased as size of prill is decreased.

How to Detonate Ammonium Nitrate

WILLIAM C. MAURER
JOHN S. RINEHART

BY USING ADEQUATE PRIMERS and preventing AN-FO mixtures from absorbing water, these mixtures are a very reliable and effective explosive for use in small holes. By using some of the smaller prills, high detonation velocities can be obtained, the strengths of these AN-FO mixtures being similar to 50 or 60% dynamite.

An experimental investigation of the detonation properties of various ammonium nitrate-fuel oil (AN-FO) mixtures in small drill holes was made at the Colorado School of Mines.[1] These tests were carried out at the school experimental mine in strong hydrothermally-altered igneous rock which contained some fractures and planes of weakness. The detonation velocities of these mixtures were measured continuously using a technique which was an adaptation of a method developed by Gibson.[2] This technique consists of placing a constant current through two parallel resistance wires placed in the drill hole as shown in Fig. 1. The voltage change across these wires is recorded on an oscilloscope as they are shorted out continuously by the ionized detonation wave. The detonation velocity is directly proportional to the slope of the trace on the oscilloscope.

Velocity Is Key to Diameter

Several types of commercial and pilot-plant ammonium nitrate were tested with 6% No. 2 fuel oil. The results of these tests are given in Table 1 on p 103.

Dr. Maurer was a graduate student at the Colorado School of Mines when the work upon which this article is based was accomplished. Prof. Rinehart is director of the Mining Research Lab. at CSM, Golden, Colo.

As the diameter of the hole is increased, the length of the zone in which reaction is taking place is increased, increasing the amount of energy released and the detonation velocity.[3] The prills having the higher detonation velocities are closer to their "ideal" detonation velocities and are therefore less dependent upon the hole diameter.

Small Prills Are Faster

The detonation velocity depends on the rate of consumption of the prills within the reaction zone.[4] As the size of the prills is decreased, the rate of consumption is increased, producing a corresponding increase in the detonation velocity. [5] The effect of prill size was investigated by measuring the velocity of several 94/6 mixtures composed of several screened sizes of prills. The results are shown in Fig. 2.

Dense Prills Are Slower

As the density of the prills is increased, the number of void spaces within the prills is decreased, thereby decreasing the number of ignition points which are produced in the interior of the prills.[6] The rate of consumption of the prills within the reaction zone is believed to depend upon the number of these ignition points which are produced and therefore the detonation velocity is decreased as the density is increased. Brands B, G and J are composed of very dense particles of ammonium nitrate and therefore exhibit poor detonation properties in small holes.

Fuel Oil Increases Energy

When ammonium nitrate is subjected to high temperatures and pressures, it undergoes an oxygen-positive exothermic reaction:

$$2NH_4NO_3 \rightarrow 2N_2 + 4H_2O + 0_2 \quad (28\ \text{Kcal/mol}).$$

If there is no carbon present, the excess oxygen combines with the nitrogen to form nitrogen dioxide:

$$4NH_4NO_3 \rightarrow 2NO_2 + 8H_2O + 3N_2 \quad (27\ \text{Kcal/mol}).$$

If there is a carbonaceous material present, e.g., fuel oil or coal, the excess oxygen combines with the carbon to form carbon dioxide:

$$3NH_4NO_3 + CH_2 \rightarrow 3N_2 + 7H_20 + CO_2 \quad (82\ \text{Kcal/mol})$$

releasing three times as much energy as the reaction of pure ammonium nitrate. This increase in energy produces a corresponding increase in the detonation velocity as shown in Fig. 3.

The maximum velocity is obtained with a stoichiometric reaction which is produced with approximately 6% fuel oil. A shortage of fuel oil produces a greater decrease in the velocity than an excess, indicating that the rate of reaction of the oxygen-positive reaction is less than the rate of reaction of the oxygen-negative reaction.

Moisture Retards Velocity

Ammonium nitrate is a very hygroscopic material and at ordinary temperatures and at relative humidities above 60%, it will absorb enough moisture from the air to dissolve itself.[7] The effect of moisture absorbed from the air and from wet holes was investigated using 94/6 mixtures containing various percentages of water (Fig. 4).

As the amount of water is increased, the detonation velocity decreased until failure occurred with a

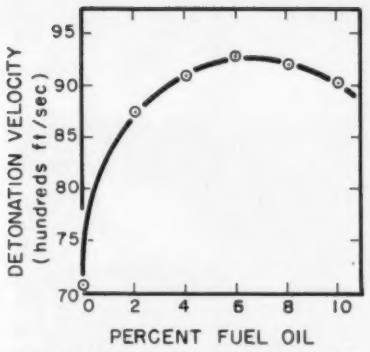


FIG. 3 Velocity falls faster with fuel-lean than with fuel-rich mixtures.

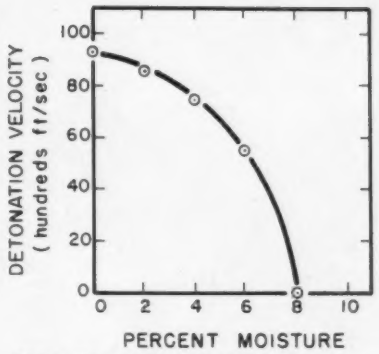


FIG. 4 Water has marked effect on velocity; failure occurring at 8% moisture.

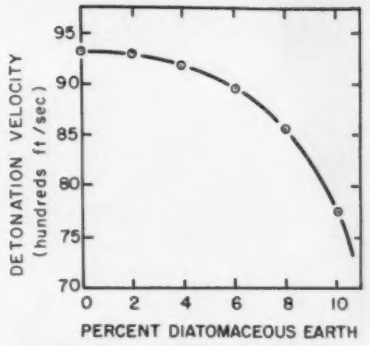


FIG. 5 Above 4% diatomaceous earth, the detonation velocity falls rapidly.

Underground in Small Drill Holes

mixture containing 8% water. As the amount of water increased, additional heat was required to vaporize and heat the moisture to the detonation temperature, thereby draining energy from the reaction zone and decreasing the detonation velocity.[5].

DE Slows Reaction

Inert material such as diatomaceous earth is often used as a coating agent on ammonium nitrate prills to prevent caking and to insure a free-flowing product. The effect of inert coating was studied by using a 94/6 mixture composed of prills coated with various percentages of diatomaceous earth (Fig. 5).

The diatomaceous earth has little effect upon the detonation velocity below 4%. Above 4%, the velocity falls off rapidly until with 10% diatomaceous earth it is only 83% of the velocity of the uncoated prills. This decrease in velocity is apparently produced largely because the coating holds an excess of fuel oil at the surface of the prill, producing an oxygen-negative reaction at the surface and an oxygen-positive reaction at the center of the prill.[5]

Pack Primer With AN

In general, AN-FO mixtures will not detonate at a velocity higher than the detonation velocity of the primer. It has been shown that any primer having a higher velocity than the steady state velocity of the AN-FO mixtures is an adequate primer.[5] With a 75% gelatin dynamite primer, the AN-FO mixtures were initiated at high overdrive velocities after which they decayed to their steady state velocities after traveling a distance of 3.0 to 4.5 in., representing a distance of 2 to 3 diameters (Table 2).

Table 1 Detonation Velocities of AN-FO Mixtures

Brand	Velocity (fps) 1½ in Hole*	2¼ in Hole*	Type
A	9,300	10,900	Porous Prill
B	Failed	Failed	Dense Prill
C	6,200	9,950	Porous Prill
D	7,700	10,500	Porous Prill
E	6,900	9,400	Porous Prill
F	8,050	10,800	Porous Prill
G	Failed	Failed	Stengel Flake
H	11,600	13,300	Microprill
I	12,300	14,300	Microprill
J	Failed	8,250	Micrograin

(*Drilled with 1½-in. and 2¼-in.-dia. tungsten-carbide bits).

Table 2 Overdrive Velocities of AN-FO Mixtures

Brand	Overdrive Velocity (fps)	Detonation Velocity (fps)	Decay Time	Decay Distance (in.)
A	12,300	9,300	30–40	3.0–4.5
C	8,700	6,200	45–55	3.5–4.5
E	8,400	6,900	40–50	3.0–4.0
H	14,500	11,600	25–35	3.5–5.0
I	14,300	12,300	20–30	3.0–4.5
J	9,500	7,700	40–50	3.5–4.5

Using a 1-in.-dia Gelex primer in a 2¼-in. drill hole, most of the mixtures failed. These failures were produced as the pressure of the detonating AN-FO mixture was released into the air space adjacent to the primer, producing a rarefaction wave which overtook the detonation wave and quenched the detonation. By filling the space around the primer with AN-FO mixture, this problem was eliminated and steady state velocities were obtained.

Overburden

In several of the tests, the rock slabbed off parallel to the axis of the hole, exposing the hole along its entire length. It was possible to study the changes in the type of rock and the planes of weakness present along these holes and to relate the detonation velocity to these changes in the rock properties. It was found that the velocity was independent of any visible changes in the rock properties, remaining constant throughout the entire length of the hole. This indicated that the property of the rock which determined its confining ability was essentially the same for the different types of rock present along the hole and that pre-existing fractures or planes of weakness did not affect the confining ability of the rock to any great extent.

(*Continued on p 108*)

FAST, LOW-COST placer mining for small operators is possible with dozers and mobile belt conveyors. Above, a D-8 Cat pushes a load of Klondike gold-bearing muck onto a horizontal section of the conveyor. Adjustable chains regulate the surge loads

Belt Conveyors Speed Placer Mining

HAROLD H. SCHMIDT

A DOZER-BELT CONVEYOR OPERATION, such as we evolved in the Klondike, is a fast, low-cost method for open cut placer mining. Basically, it consists of mobile conveyors, a sluice box and a dozer or two. This equipment can be used in various combinations.

In most open cut placer operations, a dozer pushes gravel to boxes and another dozer or dragline stacks tailings. The most expensive part of the operation is the use of dozers and, when they are used for tailings disposal, their costs may be double that of machines used in the cut. With hourly costs and production time constant, costs per yd are directly related to the distance the material is moved with the dozers.

Dozers are an efficient and low-cost means of moving material when the material is:

- dry or reasonably dry
- pushed level or downhill
- pushed 50 ft or less
- reasonably easy to dig or loosen with minimum ripping.

In developing our technique in the Klondike District near Dawson City, Yukon Territory, we first tried a belt conveyor on the most expensive part of our operation—stacking tailings. This was done by discharging the sluice boxes directly into a hopper from which the skirted conveyor pulled the unsized material, while the water and slimes overflowed.

As long as the material being sluiced had a substantial amount of rock and gravel and the discharge from the boxes was reasonably uniform and did not reflect the surge nature of the dozer load entering the dump box, the practice worked. It did not work when large amounts of clay, muck or soft bedrock went through the boxes without being disintegrated. Another disadvantage: surge loads coming down the boxes would overflow coarser sands and fill the drain.

Why We Selected A Feed Conveyor

Thus, under favorable conditions, using a conveyor to stack tailings was encouraging and we believed we could overcome the other problems by a feed conveyor which would give us:

- a steady uniform rate of feed
- a low-cost elevating medium to give sufficient height to do a good job of washing, sizing and dewatering
- a unit with good mobility so that moving and setting-up time could be kept to a minimum.

Mobility is very important: the more flexible and mobile your unit the shorter will be the distance you move the gravel. In other words, if you can move in 10 or 15 minutes, you will move fast and often; but if you require 5 to 6 hours, you will have to move the material greater distances in order to have fewer unit moves.

Developing Our Feed Conveyor

Initially we believed that it would be necessary to have a heavy-duty apron feeder for the unit we would doze on, and this feeder would in turn discharge onto a conventional belt conveyor. Upon investigation, the weight of this unit discouraged us as we felt that we would lose mobility.

Finally, we decided on an experimental unit using a 30-in. belt conveyor with an over-all length of 60 ft from head to tail pulley. Of this length, 16 ft represented a horizontal section with a loading height 28 in. above ground level. The horizontal section was skirted to expose the belt 9 in. at the back end. This width widened to 13 in. in the direction the belt moved. Just before leaving the

Mr. Schmidt, a native of Alaska and a mining engineer, has been engaged in placer gold mining in Alaska and Yukon Territory continuously (except for World War II) for the past 25 years. Currently he is operating several properties in Yukon Territory in association with Glen D. Franklin under the firm name of Ballarat Mines Ltd. Mr. Schmidt resides at 1400 Felta Road, Healdsburg, Calif.

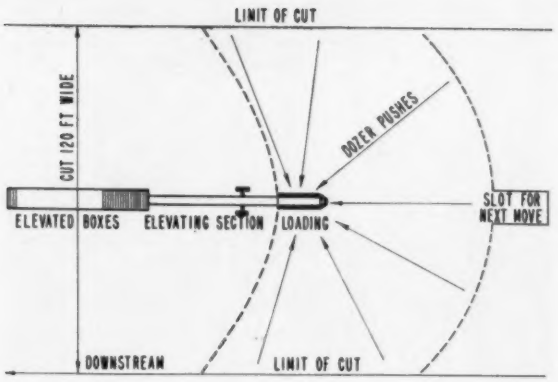


FIG. 1 In open country, where the dozer can back beyond the cut limits, the above pattern is used for dozing to conveyor.

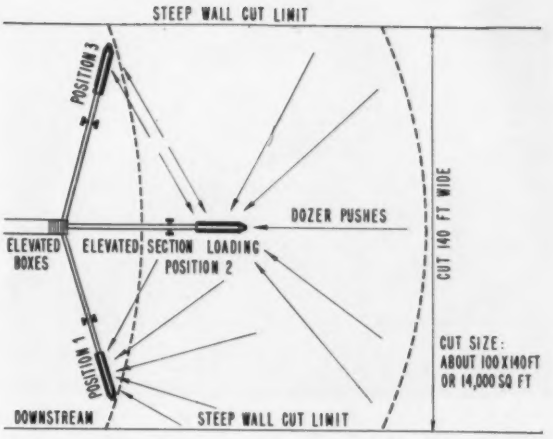


FIG. 2 Where the dozer can't back beyond the cut limits, the conveyor is extended to the side to give a straight push.

skirted section, an adjustable weighted chain was used as a load regulator. In the next 4 ft the conveyor changed from the horizontal loading section to the elevating portion at 16°.

The unit was mounted on rubber tires from "surplus aircraft" beaching gear. The axle was placed so the center of gravity was slightly on the loading end. A drawbar hitch was also placed on this end. A 10-hp electric motor was mounted at the discharge end of the conveyor. Electric power was furnished by a D4 power generating unit on skids. Numerous belt speeds were tried on this particular unit, and we ended up with 150 fpm. In our opinion, a slightly lower speed would be better but, because of the narrow 30-in. belt. we had to maintain this speed to obtain capacity. The spacing of troughing rollers in the loading section should not exceed 24 in.

Setup and Operation

The sluice plant of elevated boxes and the belt conveyor were kept on cleaned bedrock. When the dozer could back up beyond the mining width without difficulty, the conveyor loading section was pulled into a slot about 15 ft wide in the center of the mining width and extended up into the cut some 20 ft. The conveyor discharged into a washing plant directly downstream. Material was dozed onto the loading section from both sides and upstream for a maximum push of 60 ft, except when dozing directly upstream from the unit. At that point, a dozer width for 80 ft was cleaned to prepare the slot for the next move (Fig. 1).

When steep walls or stripping piles on the limits prevented the tractor from backing up beyond the mining width, the washing plant remained in the center, but the conveyor loading section was placed near a cut limit so that the tractor could push as nearly straight downstream as possible. After the area was cleaned within economic push limits, the loading section was positioned in the center of the mining width and material within the economic push limits of this location handled. A pattern similar to a dredge arc results in following these procedures (Fig. 2).

This system offers the following advantages:

1 Most material can be moved downhill or on a level because of low loading height.

2 Material is fed uniformly to washing plant.

3 The feeder is flexible and can be positioned so that the dozer makes practically all straight pushes.

4 Only about two dozer loads of material are left around the loading section when ready to move.

5 The unit is an economical elevating and transporting medium.

6 Poor drainage conditions can be handled by positioning the feeder unit to take advantage of natural conditions.

7 Because the unit is mobile, fast and easy to move, short and frequent moves are possible.

Disadvantages are:

1 It is necessary to operate and to maintain another unit.

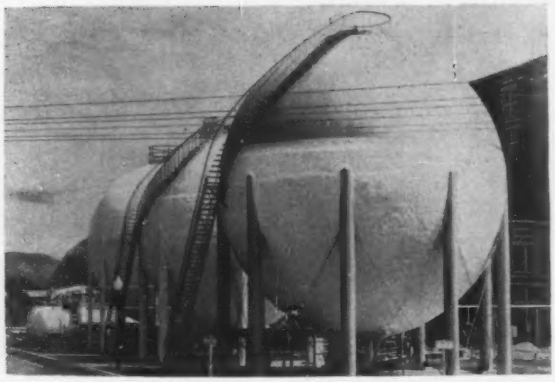
2 Under conditions of moist soil or clay, a bad "arching" situation would develop so that an attendant would have to break the material down with a shovel or bar to keep it feeding. From observation it is believed that this would not be a problem with a 42-in belt.

The maximum capacity of the unit was about 135 cu yd per hr. Moves required 1 hr, but this time could definitely be lowered. The unit was used for a total of about 1200 operating hours and showed no rock damage and scarcely any wear.

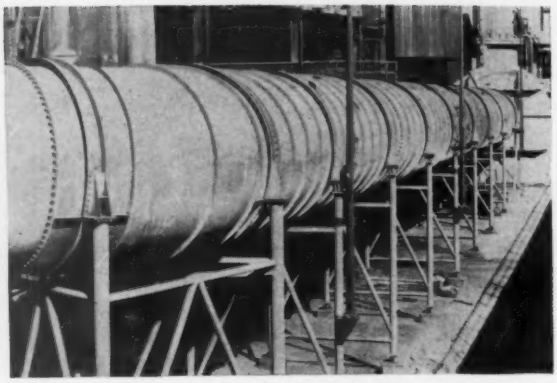
New Units Planned

From our work with this experimental model, we believe that a similar 42-in. unit with modifications is the answer for feeding and elevating material to a washing plant. In order to keep a washing plant light and mobile, we anticipate stacking the oversize with another belt conveyor mounted on a D8 tractor using hydraulic dozer controls to raise or lower the conveyor frame. This D8 unit would also have a generator mounted on it to furnish electric power for the feed conveyor, stacking conveyor, and a sand pump to stack the undersize. The undersize sands would be pumped through a line suspended underneath the stacker and discharged through a controlled end that could be directed as a monitor. This monitor could then "blast" the coarse tails of the stacker as they are discharged, thereby increasing the volume of tails from a single stacker position by spreading them. Connection between the sand pump mounted on the washing plant and fixed line on the stacker would be by rubber hose and "Pierce" couplings.

This unit should have a daily (24 hr) capacity of from 4000 to 5000 yd under average conditions and require 2 men on a shift. Maintenance costs should be considerably lower than with a conventional dozer or dozer-dragline open cut operation.



THREE 38-FT-DIA HORTONSPHERES storing anhydrous ammonia have been painted with zinc-rich prime coatings.



300-FT FLUE, conveying gases at 250-450° F. was painted with zinc-rich primer, and thermo-resisting outer coating.

How Mines Can Use Zinc

ZINC-RICH PAINTS will extend the life of mining equipment by inhibiting corrosion, according to recently-concluded six-year tests carried out in British Columbia by the Consolidated Mining and Smelting Co. of Canada, Limited.

Case studies show that zinc-rich paint can outlast conventional maintenance coatings by at least two to three times.

Two conditions are essential: First, the zinc-rich paint must contain sufficient metallic zinc in the dried film to ensure electrical contact between the pigment particles and the underlying steel, so that cathodic protection is afforded in the presence of an electrolyte. Second, the zinc-rich paint must be properly applied on a clean surface.

Within these limitations, zinc-rich paint is accepted by Cominco as a standard maintenance primer. Structures which formerly were cleaned, reprimed and repainted every three years now, after blast cleaning and priming with zinc-rich paint, require only renewal of the topcoat and minor touch-up or renewal of the zinc-rich primer every five years. Thus recleaning and repainting are less frequent, made easier and less expensive.

Zinc-rich paint consists essentially of finely powdered metallic zinc, mixed in just as little vehicle as possible. A number of vehicles have been successfully used, characterized by their ability to give a durable film at the high ratios of pigmentation required, and by the fact that they do not interfere with the chemical activity of the zinc. Commercial zinc-rich paints are now available in such vehicles as silicate, polystyrene, chlorinated rubber, and phenolic-modified alkyds. In the U. S., this type paint, when using inorganic vehicles, is not commonly known as "Zinc-Rich."

The paint originated as a British development. Today, in England, zinc-rich paint is widely used in maintenance work by all industries. After introduction in the United States and Canada a few years ago, zinc-rich paint has found increasing use in such applications as:

Priming clean steel for atmospheric exposure, when in place.

Priming ungalvanized steel for underwater service, either fresh or salt.

Priming soil pipe lines when a cathodic protection system is not practical.

Coating ungalvanized steel protected by cathodic installations

Touching up new galvanized products damaged during transport or erection.

Reconditioning rusted galvanized surfaces.

Service tests at The Consolidated Mining & Smelting Co. of Canada, Ltd., strongly confirm the first use. Other applications for which the paint is recommended were not as completely investigated. Most tests concluded to date involve maintenance priming of steel structures, following failure of the protective coating system applied earlier.

EDITORS NOTE: The aluminum industry has led the field in the past in using its products in its plants. Aluminum cooled transformers at Reynolds Jamaica are an example. It is a pleasure to report that this policy has been adopted by nonferrous metals producers, and to present this article by Cominco.

Why It Protects

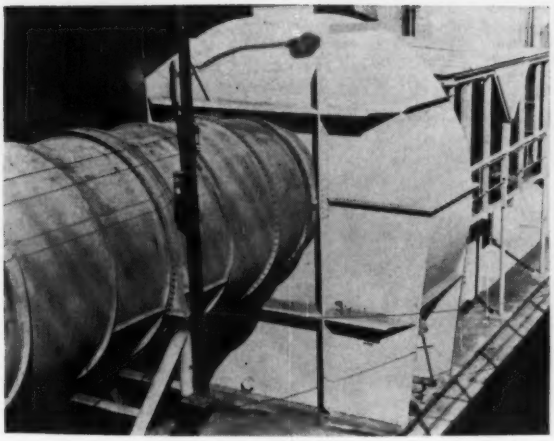
Zinc-rich paint protects steel structures in precisely th way that the zinc coating protects galvanized steel. In both cases, the zinc sacrifices itself slowly over a period of many years, to prevent rusting of the steel beneath.

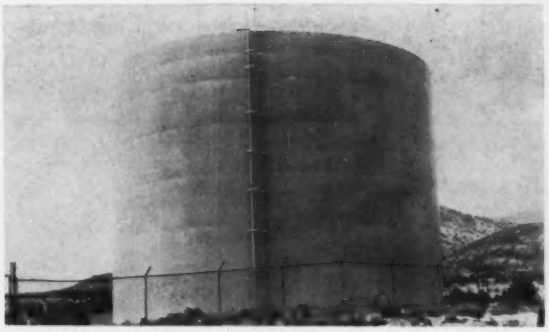
The amount of protection against corrosion depends upon the thickness of the zinc coating. The heavier the coating, the longer the metal beneath remains rust-free.

Zinc-rich paint protects steel in two ways: not only as a long-lived barrier, but also by directly inhibiting corrosion through "sacrificial" electrochemical action at small areas eventually exposed.

With all paints, pinholes will lead to corrosion sooner or later. (And it is most difficult, if not impossible, to avoid them.) With zinc-rich paints, as with all zinc coatings, the formation of rust at pinholes is much delayed, and does not take place until all the zinc available for electrochemical protection is used up. Not uncommonly, the pinholes are sealed by zinc corrosion products which also inhibit rusting. Therefore, the life of the coating is further prolonged.

Corrosion is an electrochemical process in which metal is destroyed by the action of numerous galvanic cells on the surface. Corrosion is stopped when a current of sufficient magnitude to stifle the galvanic cells, is caused to flow to the metal to be protected. Zinc, because of its greater electrochemical reactivity as compared to steel imposes a flow of such





ONE-MILLION-GAL storage tank owned by city of Trail, B.C., is primed with zinc-rich paint for long-term service.

TERMINAL of lead-lined 300-ft flue (left) prime coated with zinc-rich paint and top-coated with heat-resistant paint.

To Sell Zinc

protective current. The constituents of ordinary paints have no such influence.

Zinc-rich paint protects both by providing the steel surface with a relatively impervious coat, and through electrochemical action that occurs when the steel base metal is exposed through pinholes or mechanical damage. To obtain this second advantage, good electrical contact is essential between the zinc and the steel.

How To Specify

Only a part of the zinc in the paint participates in the electrochemical process, those zinc particles in electrical contact with the steel surface and with each other. That fraction is known as the percentage of available zinc. Tests show that this percentage, in commercially-sold paints highly pigmented with metallic zinc dust, can range from 0 to about 50%. Obviously those containing the most available zinc will protect longer.

Particle size of the zinc metal also influences the percent of zinc available for electrochemical action. The smaller the particle size, generally, the higher will be the percentage of available zinc and subsequent protection.

Some paint vehicles, Cominco tests show, are better than others for zinc-rich paints. Silicate, polystyrene, chlorinated rubber, and phenolic modified alkyd vehicles are found able to hold enough zinc-dust pigment in suspension for good cathodic protection. Other desirable vehicle properties include good film-forming and flow, an ability to keep the zinc dust in suspension so that it will not settle out and form a hard cake, and good resistance to weather so that the paint will last a long time in service. Cominco has found that the vehicles noted above possess these qualities.

How To Apply

Regardless of formulation, zinc-rich paints apply easily if handled properly. The paint is available ready-mixed or as a two component system, depending upon the vehicle. The latter product requires mixing before application. Application costs will vary, depending upon source of supply and manhour costs. In Western Canada, zinc-rich paints cost about $13 to $14 per gallon as applied to exterior structures.

Mixing. Unless zinc particles are well suspended in the paint vehicle, segregation can occur. Settling can lead to a "zinc-poor" coating on some sections of the painted metal, with relative loss of cathodic protection. Frequent mixing is desirable. If sprayed, continuous agitation is needed.

Cleaning. Zinc-rich paints are effective only over well cleaned surfaces. All old paint must be stripped. Rust should be removed to bare metal. The cleaner the surface, the better the protection by the zinc-rich paint. Blast-cleaning or its equivalent is recommended.

Painting. Zinc-rich paint may be brushed or sprayed. Painters working with brushes from open containers can keep the zinc in suspension by a mixing stick. For hand painting, half gallon containers will be found most convenient.

Spray painting is easily accomplished, and nozzle clogging is not a problem when proper procedures are observed. Continuous agitation with a powered stirrer will be needed.

The better zinc-rich paints dry fast, and will allow over-coating within 30 min. under favorable drying conditions.

Pipe lines. At Cominco, pipe lines for transfer of liquid anhydrous or aqua ammonia are 6 to 14 in. in diameter. Pipe surfaces are continuously wet in service, and often covered with ice.

Regular maintenance under earlier schedules called for priming with one of several paints, and overcoating with standard types of finished coats applied in varying thicknesses. Coatings usually failed before repainting was anticipated and often required reshuffling of maintenance schedules.

Most recently, pipes have been protected with zinc-rich paint. After blast cleaning, pipes are prime coated with a polystyrene vehicle zinc-rich paint. Some pipe lines are overcoated with one, two or three finish coats. Others are wrapped with 10-mil, pressure-sensitive vinyl or polyethylene tape over the prime coat. See Table I. Five year life in continuous outdoor service is achieved with a coating system of polystyrene zinc-rich primer with one top coat of the same paint. Maintenance costs are reduced impressively.

Steel Structurals. Two years after construction of a bulk potash storage building at Cominco's Trail, B. C., facility, the original paint failed. Rapid corrosion of the steel resulted from the deliquescent potassium chloride dust settling on the metal in unloading operations.

During building construction, steel beams were primed in a planned schedule set forth in Table II. Two top

Table I—Pipe Line Maintenance*

Protective Coating System		
Primer	**Top coats**	**Life**
Red lead/linseed oil vehicle	all received 1, 2, or 3 top coats in	<3 yr
Red lead/alkyd vehicle	varying thickness	<3 yr
Red lead-zinc chromate/chlorinated rubber vehicle	or overwrapped with 10-mil pressure-sensitive vinyl or polyethylene tape	<3 yr
Zinc chromate/alkyd vehicle		3 yr
Zinc-rich/polystyrene vehicle		>5 yr

*At Cominco, liquid and aqua ammonia.

Table II—Steel Structural Maintenance*

Protective Coating System		
Primer	**Top coats**	**Life**
Red lead/phenolic vehicle	all received two coats of fume-resistant paint with alkyd vehicle	<2 yr
Zinc chromate/alkyd vehicle		<2 yr
Red oxide-zinc chromate/alkyd vehicle		<2 yr
Zinc-rich/polystyrene vehicle	one coat of vinyl mastic	>6 yr (estimated)

*At Cominco, exposed to KCl dust fallout.

Table III—Exterior Maintenance of Ammonia Storage Tanks

Protective Coating System			
Primer	**Top coats (3)**	**Life**	**Maintenance Costs**
Red lead	oil-base paint	<1 yr	$1800–2100/yr
	asphaltic paint	<1 yr	$1800–2100/yr
Zinc-rich/polystyrene vehicle	oil-base paint	>4 yr	none

coats of standard alkyd fume-resistant paint were specified. It soon became evident that the corrosive conditions had been under-estimated, as rapid failure of the coating occurred.

In repainting with zinc-rich coating, all structural steel is first blast cleaned. Primer is a polystyrene vehicle zinc-rich paint. Top coat is a heavy-bodied vinyl mastic. Present indications are that the new coating system will outperform the original systems many times.

Hortonspheres. Uninsulated, welded, 38-ft-dia hortonspheres of carbon steel are used to store anhydrous ammonia. They are wet and often heavily iced. Table III lists past maintenance practices.

The zinc-rich maintenance schedule calls for slag blasting, prime-coating with a polystyrene vehicle zinc-rich paint, and top finishing with three coats of oil base paint. No paint maintenance has been necessary for the past four years, a direct saving on the order of $8400 in paint and labor alone.

Exhaust Flues. Gas temperatures in Cominco's lead sintering plant main flue range from 250° to 450° F. The 300 ft steel flue, conveys gases from the sinterer to a treater. Its exterior surfaces were primed earlier with zinc-chromate/red oxide paint, and finished with an oil-base maintenance coating. Total dry film thickness was 5 mils, but the coating system failed rapidly.

In 1957, the flue was blast cleaned, primed with zinc-rich paint in a phenolic-modified alkyd resin vehicle, and finished with one coat of a metal pigmented heat-resisting paint. The flue surface continues rust-free to date.

A humidifying tower, 30-ft in dia and 60-ft high, in the sintering circuit has been similarly treated with similar results.

Circulation along the 300-ft flue is handled by a 15-ft-dia fan. In earlier maintenance work, the fan casing was shop primed with zinc-chromate/red oxide paint and finished with an oil-base maintenance coating to a total dry film thickness of 5 mils. The painted surface failed in less than two years because of rapid corrosion.

Coating Failure. With two exceptions, service life of all zinc-rich painted surfaces has been completely satisfactory.

Localized overheating brought blistering in small areas of a storage tank. However, the zinc-rich primer surface remains sound, and rusting has not occurred.

The other case involves the exterior of a carbon dioxide scrubber tower, which previously required constant maintenance. The tower was blast cleaned, primed with zinc-rich paint, and finished with a phenolic-modified epoxy resin coating. The tower has rusted in small, localized areas, although generally it remains acceptable. In the light of further experience Cominco feels that the failure was due to the topcoat and the use of catalyzed coatings, such as the phenolic modified epoxy resins, and asphaltic coatings for overcoating zinc-rich paints is not recommended.

An Excellent Primer

Zinc-rich paint in a polystyrene vehicle is now employed at Cominco as a general primer for much maintenance work. Metal guard rails, fire hydrants, gates, and generally all metal surfaces out of doors that can be blast cleaned, now are protected with zinc-rich paint. Two or three finish coats in a variety of coating materials are used.

If Cominco finds it practical to prepare any surface by blast cleaning or its equivalent, a zinc-rich paint now is preferred as the standard prime coat. When the surface is expected to be exposed to significant moisture over much time, zinc-rich paints will invariably be chosen.

Small Drill Holes

(*Continued from p 103*)

Once the AN-FO mixtures were initated at their steady state velocities, the velocity was independent of the amount of overburden, propagating the entire length of the hole at their maximum velocities with only 2- or 3-in. overburden.

Wood spacers were placed between columns of 45% Gelex dynamite and the detonation propagated around all of the spacers, ranging in length from 8 to 24 in. The second or receptor charge was initiated in each case by the shock wave which traveled through the air adjacent to the spacer with a velocity equal to the detonation velocity. In each case, the receptor charge was initiated at the spacer-receptor interface with no delay time being detectable. Wood spacers with lengths from 2 to 12 in. were used in columns of AN-FO mixtures and in all of the tests the receptor charge was initiated at its steady state velocity by the expanding products for the first charge. The AN-FO mixtures

WHY IT COSTS LESS TO OWN A CAT GRADER

Most motor graders *look* pretty much alike, no matter who makes them. They handle similar jobs, too, and it isn't always easy to *see* any big difference in the way they handle them. In fact, the manufacturer's suggested prices usually are not greatly different for machines of nearly equal specifications—regardless of the "deal" that may be offered a buyer. But *used* motor graders vary considerably in price. Why?

The Buyer Determines Price

A used machine is priced at what the buyer is willing to pay . . . it's a measure of what *he* thinks is left in a machine. So, with used equipment, the buyer sets the price. This is clearly demonstrated at used equipment auctions. A check of auction prices throughout the country shows, for example, that the Cat No. 12 Motor Grader brings substantially higher prices than comparable machines of other makes—as much as 80% more. (Only machines of the same age, same condition and with similar attachments were compared.) What makes a Cat Motor Grader more desirable than other makes?

A Feature That Affects Cost

Any machine is desirable if it is known to be dependable. This reputation can only be the result of true quality design and quality construction. The Cat oil clutch is a good example. It was designed and is built to give long, trouble-free life. But, how well does it do it? Let's examine the records of just one Caterpillar Dealer who has 161 oil clutch-equipped motor graders in his territory. His records show that in four years he has sold only $24.38 worth of parts for motor grader oil clutches! One machine in his territory went 2524 service meter hours without any work on the clutch. Many users report 2000 hours of service before the first adjustment. In 1000 hours of operation only about .0025 inch of wear can be expected—less than the thickness of a human hair. And, since all parts are constantly bathed in oil there is no need for lubrication maintenance. Less wear, less attention mean not only lower total repair costs but more time on the job . . . less down time. Of course, the oil clutch is just one example of many quality features in Cat Graders.

A Look at Total Cost Records

The cost records of private owners and governmental bodies show which machines cost less. For example, an Indiana county keeps individual cost records on their six motor graders, 14 trucks, three loaders and five tractors. Their records showed that a year-old No. 12 needed only a set of head gaskets and two spark plugs with $25 labor, while two newer graders of another make needed major engine repairs, new clutches and side shift linkage. One town in New Hampshire reports that in over 20,000 hours, their No. 12 has never had a breakdown that held up work more than three hours. Operating costs—24¢ per hour exclusive of fuel, oil and operator. Comparing a Cat No. 12 to another make (after 3½ years' service), the records of an Arkansas county showed a saving of $2478.57 in parts and labor for their No. 12.

What's in It for You

Others have proved that Cat Motor Graders cost less in the long run because they are built better in the beginning. Your Caterpillar Dealer has additional facts and figures on low-cost operation of Cat Graders in your area. Ask him for free Cost Record Books so that you can keep individual machine records on your equipment. Prove to yourself that it costs less to own a Cat Grader.

Caterpillar Tractor Co.,
General Offices, Peoria, Ill., U. S. A.

CATERPILLAR

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Small Drill Holes

(*Continued from p 108*)

were not initiated by the shock wave in the air adjacent to the spacer because of their low sensitivity.

Short Bags Are Faster

In all of the tests, the AN-FO mixtures were placed into the drill holes in plastic bags and tamped. With bags having length to width ratios of 10:1, the detonation velocity fluctuated as the detonation wave propagated along the hole, never reaching a steady state velocity. By decreasing the length to width ratios of the bags to 6:1, steady state velocities were obtained, these velocities being 1000 fps to 3000 fps faster than the velocities with the longer bags. The fluctuations in the velocities were produced by the uneven density of the AN-FO mixtures along the holes, the tamped ends of the bags being more tightly packed.

Primacord's Effect

In large drill hole blasting with AN-FO mixtures, Primacord is often placed along the hole to increase the rate of propagation of the detonation wave in the hole. Several tests were made in 1¾-in. drill holes placing Primacord, ranging in sizes from 50 to 400 grain per ft, parallel to the axis of the hole. The 50-grain Primacord did not initiate the 94/6 AN-FO mixtures at any point along the 5-ft holes, whereas all of the larger sizes initiated the mixtures continuously, resulting in effective propagation velocities of 19,000 fps to 24,000 fps.

When an explosive is initiated it must propagate a distance of 3 to 4 diameters before it reaches the steady state velocity.[8] The actual detonation velocity in the AN-FO mixture is therefore probably less than its steady state velocity since the furthest distance across the hole is one diameter. Because of the reduced detonation velocity within the AN-FO mixture, the Primacord may actually have a detrimental effect and decrease the energy released with the AN-FO mixture.[8]

The effectiveness of the Primacord in initiating the AN-FO mixtures should be the same in small or large diameter holes since the mixtures are initiated at points along the Primacord and the conditions at these points are essentially the same in a small or large hole.

Assistance of the Ideal Cement Co. for the research fellowships and the Colorado School of Mines Foundation for a research grant under which the major portion of this work was performed is gratefully acknowledged.

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NEW BOOKS

(*Continued from p 46*)

Geology and Mineral Resources of the Lemhi Quadrangle, Lemhi County, Pamphlet No. 124, by Alfred L. Anderson. This book includes a description of recently discovered thorium deposits. Available from the Idaho Bureau of Mines and Geology, Moscow, Idaho. 111 pp. Price $1.75.

Glacial Geology of Stanley Basin, Pamphlet No. 123, by Paul L. Williams. Available from the Idaho Bureau of Mines and Geology, Moscow, Idaho. 29 pp. Price $1.25.

Problems in Applied Descriptive Geometry, by Matthew McNeary. These problems are designed to be used with the textbook "Applied Descriptive Geometry," by Warner and NcNeary (McGraw-Hill). Problems include many common to mining such as tunnel design and formation projection. Published by the McGraw-Hill Book Co. Inc., 330 W 42 St., New York 36, N.Y. 75 pp. Price $3.95.

Geology of the Fort Jackson North Quadrangle, by W. K. Pooser and H. S. Johnson, Jr. Scale 1:24,000. This map is available from the State Development Board, Columbia, S. C. Price 25¢.

Preliminary Geologic Map of the Coastal Part of the Malibu Beach Quadrangle, Los Angeles County, California, by J. E. Schoellhamer and R. F. Yerkes, Scale 1:12,000. Reproductions are available at the Public Inquiries Office, USGS, 1031 Bartlett Bldg, 215 W. 7 St., Los Angeles, Calif.

New York and Vicinity, prepared by the USGS. This set of eight topographic maps has a scale of 1:24,000. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Price $1.50 for each or $12.00 for complete set.

The Geology of Ovalau, Moturiki and Naingani, Bulletin 9, by P. Ibbotson. Available from the Geological Survey Dept., Duva, Fiji. Price 5s.

Conference on Minerals Held in Ankara, Turkey, December, 1959. This conference, sponsored by CENTO, summarizes the mineral positions of Turkey, Pakistan and Iran. Available on request from the Office of U.S. Economic Coordinator for CENTO affairs, American Embassy, Ankara, Turkey. 69 pp.

Progress Report on Geologic Investigations in the Kootenai-Flathead Area, Northwest Montana, 3, Northern Lincoln County, Bulletin 23, by Willis M. Johns. Available from the Montana Bureau of Mines and Geology, Butte, Mont. 57 pp plus maps.

Geology of the Gods Narrows Area, Gods Lake Mining Div. 53L/9 (West Half), by G. S. Barry. Available as Publication 60-1 from the Dept. of Mines and Natural Resources, Winnipeg, Manitoba. 33 pp plus map.

Triassic Stratigraphy and Faunas, Queen Elizabeth Islands, Arctic Archipelago, Memoir 316, by E. T. Tozer. Available from the Dept. of Mines and Technical Surveys, Ottawa, Canada. 116 pp plus numerous plates. Price $250.

Geological Map of New Zealand, Sheet 1, North Cape. Scale 1:250,000. Published by the Dept. of Scientific and Industrial Research, Wellington, New Zealand.

Caves of Tennessee, Bulletin 64, by Thomas C. Barr, Jr. Available from the Dept. of Conservation and Commerce, Div. of Geol., Nashville, Tenn., 567 pp plus maps.

The Buganda Group, Uganda, East Africa, by R. B. McConnell. Available from the Geological Survey, Georgetown, British Guiana. 11 pp.

Preliminary Gravity Map of West-Central Maine. Photostatic copies available from Robert G. Doyle, State Geologist, Dept. of Economic Development, State Office Bldg., Room 211, Augusta, Maine. Price $1.00 plus 3¢ for in-state purchases.

Mineral Deposits of Luna County, New Mexico, Bulletin 72, by George B. Griswold. For sale by the New Mexico Bureau of Mines & Mineral Resources, Campus Station, Socorro, N. Mex. 157 pp plus maps. Price $3.00.

New Miocene Formation in South Dakota, Miscellaneous Investigations No. 3, by J. C. Harksen, J. R. MacDonald and W. D. Sevon. Available from State Geological Survey, Union Bldg., U. of S. Dak., Vermillion, S. Dak. 11 pp.

Shallow Outwash Deposits in the Huron-Wolsey Area, Beadle County, South Dakota, Report of Investigations No. 91, by Ian R. Walker. Available from State Geological Survey, Union Bldg., U. of S. Dak., Vermillion, S. Dak. 44 pp.

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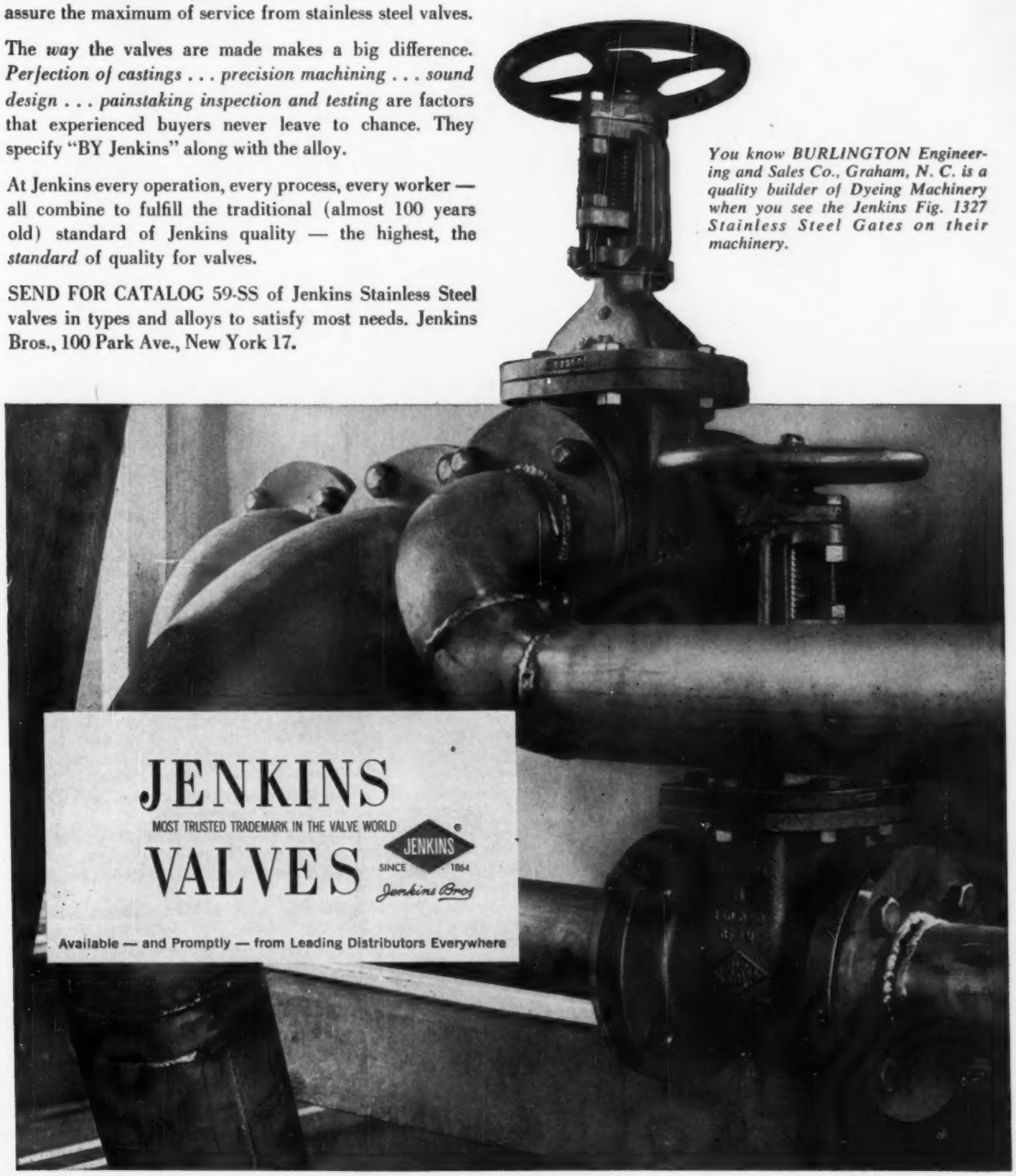

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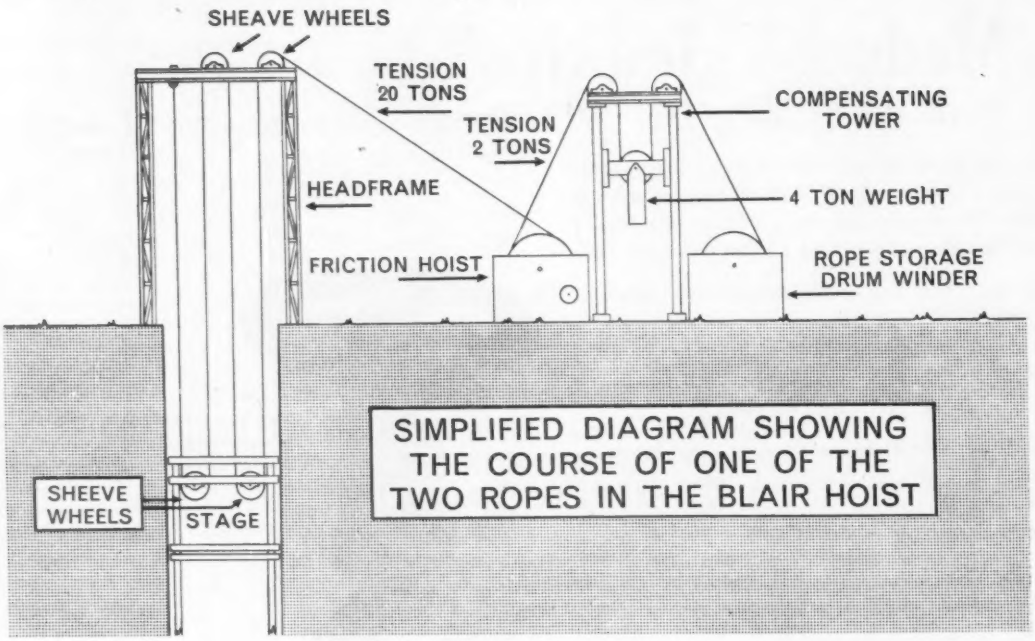

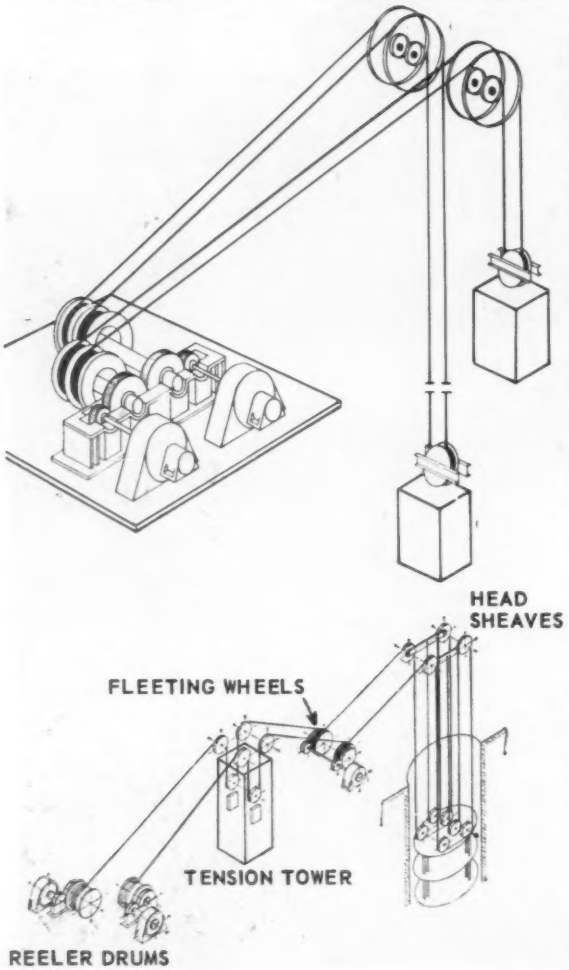

Blair Hoist Reaches Lower, Lifts More With Smaller Ropes

A NEW-TYPE HOIST is being used in South Africa for shaft sinking and hoisting. Designed by Robert Blair, consultant to the Anglo American Corp., the hoist has two drums and two ropes on each drum.

Because the skip load is distributed equally on two ropes, smaller ropes can be used, payloads can be increased, and deeper hoisting is possible. No tail rope is needed.

According to OPTIMA, June 1961, the hoist is equipped with two independent drums; each having equally spaced circumferential flanges corresponding to the number of ropes attached to the conveyance operated by the drum.

The continuous equalization of rope tension is effected either by a simultaneous coiling or uncoiling of the ropes on a compensating drum attached to the conveyance or by movable headgear sheaves supported on interconnected hydraulic cylinders which permit the sheaves to move in vertical guides.

An electro-mechanical monitoring device is fitted to each drum to detect the false coiling of any rope.

In South Africa, Zandpan Gold Mining is using a Blair stage hoist for the sinking stage of its shaft-sinking operation, and Buffelsfontein is installing Blair multi-rope, multi-layer hoists for permanent service.

At the President Steyn gold mine, a Blair platform hoist lowers and raises a 24-ft 6-in.-dia stage 70 ft long whose working weight is 142,500 lb. The ropes are $1\frac{11}{32}$-in.-dia. and each is 28,000 ft long.

The Blair hoist that has been installed at President Brand, the first permanent-service hoist, is able to lift a 10-ton payload from a depth of 5250 ft at 3000 ft per minute. The skips are held by two $1\frac{1}{8}$-in.-dia ropes per conveyance. The unit is driven by a 3100-hp Ward Leonard-controlled motor.

Because there is more stretch with a small-diameter rope, a trailing chute has also been developed for skip loading. A mechanism engages the skip and the chute during loading, and maintains the relative positions of the chute discharge lip and the skip. This accelerates the process of loading and reduces the amount of spillage.

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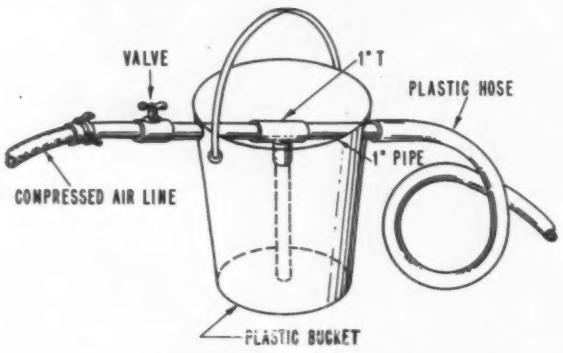
OPERATING IDEAS *(Continued)*



AN/FO Loader Is Easy To Build

PRESTON MINES, which is converting to underground blasting with AN/FO wherever possible, has developed a simple air-operated loading device.

According to the NORTHERN MINER, a plastic pail, 1-in. pipe, hose and a valve are all that is needed. Drawing at left, prepared from description, shows the assembled pipe shoved through the pail and hooked to a compressed air line. After the AN/FO mix has been prepared, it is loaded in the bucket, the delivery hose inserted in the hole and the air turned on. The hose is gradually withdrawn as loading proceeds. In another experiment, a length of plastic pipe is substituted for the pail.

Preston Mines Ltd. operates a gold mine near South Porcupine, Ont., and operated a uranium mine near Elliot Lake until November of last year.

Anaconda Watches Truck Component Costs

A. E. MILLAR, general manager of Anaconda's Weed Heights operations, described an accounting system designed to give a close check on truck component costs at the Seattle meeting of AMC. This procedure allows accurate evaluation of each truck's performance. Millar's description follows:

Although we do not keep costs on each individual truck, our accounting system is so set up so that we do have costs for each of seven component parts for the entire fleet of haulage trucks, and we know the *per hour* cost of repairs for each of the component parts—engines, transmissions, converters, differentials, rear axles, body and chassis, and tires.

We divide each of the above seven by the grand total cost for all of our heavy haulage units and arrive at a percentage figure for each one of the seven component parts. This in itself is a very useful figure to continually watch, namely what percentage of the total cost is required for engines, etc.

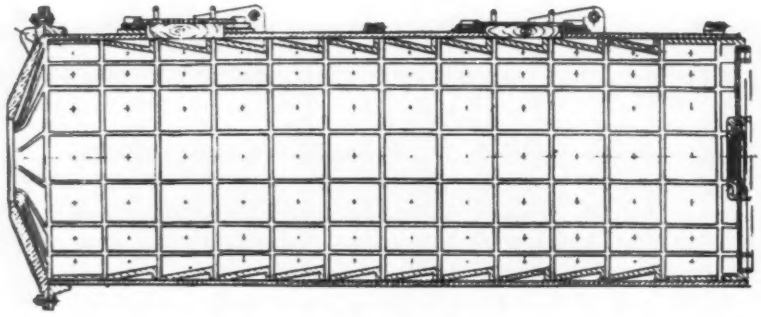
It should be noted in passing that the above costs take in repair parts and also repair labor.

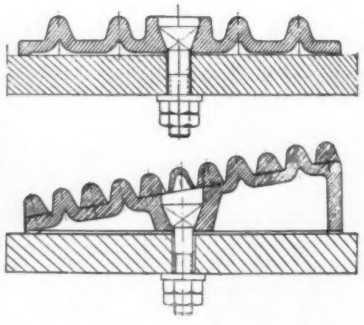
In the office in the garage we have a board that shows the relative cost of repair parts and also repair labor for each haulage truck. In setting up this board originally, we took a certain period of time, let us say during the past five years and started with this figure. This board has eight columns for said costs. The first column shows the individual truck's position for total repairs, exclusive of tires, and exclusive of body and chassis repairs. The other seven columns show each truck's position for repair costs for engines, transmissions, converters, differentials, rear axles, front tires, and rear tires.

By taking the amount of money spent for each of the component parts and dividing it by the total money spent for all repairs we arrive at the percentage figure for each component. For example, engine repair is 57% of total, transmission 15%, etc.

We now, over the same period of time, namely five years as used in this example, take out the total hours operated for each truck and also the number of changes of engines for each truck, number of changes of transmissions, etc. By dividing the total hours operated by the number of changes we then determine average hours per change for engines, transmissions, etc.

In order to clarify the above let us say that a particular truck has so many average hours per engine change and so many average hours per transmission change, etc. For this truck's weighted average we take the engine hours times the percentage figure explained at the beginning of this record, namely 57; then the average hours per transmission change, multiplying by the percentage figure of 15; and follow this in a similar procedure for converters, differentials, and rear axles. The summation of these weighted averages gives us a definite figure pertaining to this particular truck. By following the same procedure for each individual truck we can then place the trucks in their proper order in column one which is the evaluation column.





Improved Ball Mill

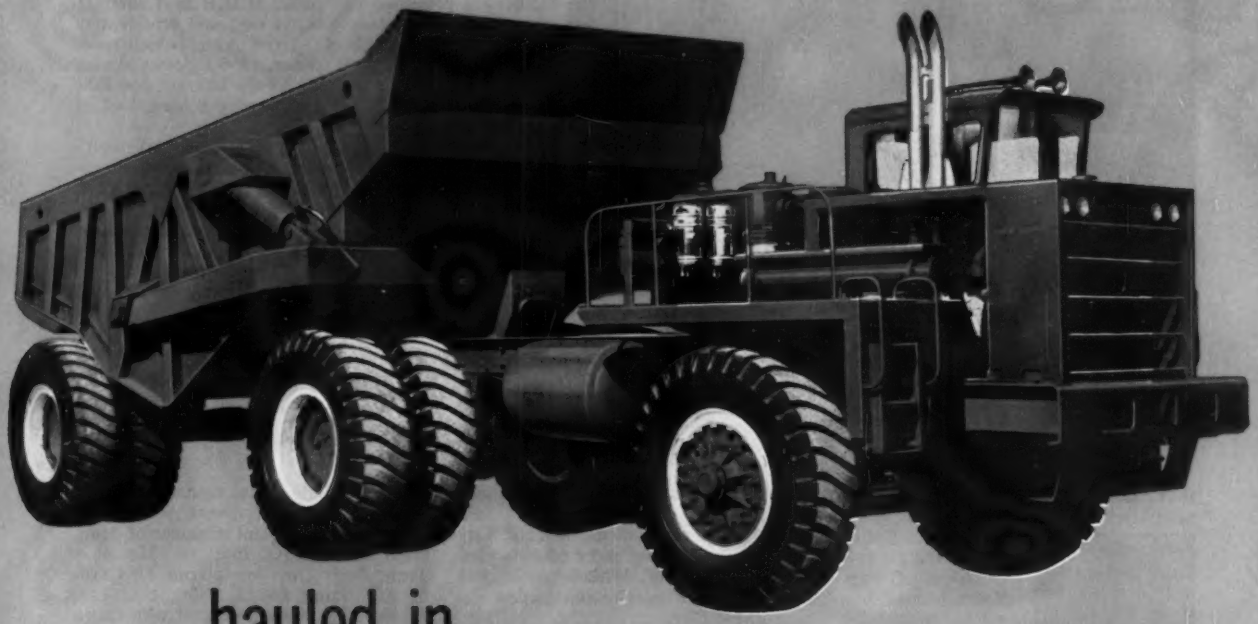
A 10 TO 15% INCREASE in output for a 10% reduction in energy consumption, plus higher liner life, is claimed by Polish operators of the above ball mill, which is used in the cement industry.

According to the EUROPEAN TECHNICAL DIGEST, "sorting plates," which assure uniform distribution of the balls in the crusher, have an 11° slant relative to the ball mill's axis. The sorting plates provide a multi-recess pattern, which makes the elimination of separation chambers possible.

The mill was first described in CEMENT-WAPNO-GIPS (Poland), No. 6, 1959.

fact not fiction:

508 TONS



hauled in

ONE HOUR

by

ONE TRUCK

Yes, it's a fact . . . a KW-DART D6550 end dump tractor-trailer unit hauled 508 tons of iron ore in one hour! And the D6550 moved this ore a distance of 6,000 feet from shovel to tipple, over adverse grades averaging 5%—with some grades up to 12%.

This One Unit produced the output of three conventional end dump trucks . . . with one-third the operating personnel . . . at greatly reduced maintenance and operating costs.

KW-DART's "Engineering for the Job" was the reason behind this record-breaking performance. If you're looking for a truck to give you higher production at a lower cost per ton, consult with:

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Dart Road and North Manchester Trafficway, Kansas City 20, Missouri

PERSONALS

Brinckerhoff Lilley Wormser Dunning

Charles M. Brinckerhoff has been named to be 1961 recipient of the Egleston Medal, Columbia University's highest award for "distinguished engineering achievement." The medal was presented at ceremonies held October 21 in the Rotunda of Columbia's Low Memorial Library as part of the annual Engineering Dean's Day program.

The medal was presented (see photo at left) by **Robert D. Lilley,** vice president, Western Electric Co., and president of the Columbia Engineering School Alumni Assn. (which sponsors the award), with **Felix E. Wormser,** 1956 Egleston Award winner and former Assistant Secretary of the Interior, and **John R. Dunning,** dean of Columbia's Engineering School, looking on.

The citation accompanying the award cited Brinckerhoff's achievements as "metallurgical engineer, mining engineer, executive and director of companies in the field of world metal resources, particularly as president of the Anaconda Co., devoted to the betterment of inter-American relations in the finest traditions of the engineer-diplomat, industrial representative for twenty-three years in Latin America enhancing both personal and corporate integrity in those countries where he served, holder of international honors in his field, devoted alumnus of Columbia and member of the Columbia Engineering Council, steeped in the best tradition of his profession and ambassador without portfolio for that profession and the United States, both here and abroad, to the advancement of human welfare and human relations."

R. E. Kendall has been appointed to the newly-created post of Canadian project manager for United States Borax & Chemical Corp. Kendall was formerly engineering manager at the company's Boron, Calif., plant. He will now make his headquarters at Saskatoon, Saskatchewan, where U.S. Borax has been investigating potash permits held since 1957.

Kendall

Kendall will coordinate all engineering and geological efforts of the U.S. Borax-Homestake Mining Co. joint venture to complete studies relating to possible large-scale potash production in Saskatchewan.

A graduate of Dartmouth College and the University of Nevada Mackay School of Mines, Kendall joined U.S. Borax in 1954 after having served as mining engineer with Dayton Consolidated Mines Co., Virginia City, Nev., and as general foreman of the Resurrection Mining Co. of Leadville, Colo.

Karl G. Bunnell, labor relations specialist at the Columbia Geneva works at Provo, Utah, has been named superintendent of industrial relations at U.S. Steel Corp.'s Atlantic City iron ore mine.

Thomas M. Hill of Salt Lake City has been appointed chief metallurgist for the Federal-Gas Hills Partners uranium mill in the Gas Hills area of central Wyoming.

Hill has been with Federal the past four years. He has been with the company's main office in Salt Lake City.

Douglas H. Rodgers has been named project manager for U.S. Steel's American Bridge division at the Atlantic City iron ore project now under construction. He replaces **C. W. Whiteley,** who was transferred to a missile construction site near Rapid City.

Rogers will direct the final steel erection of plant buildings, conveyors and other facilities at the iron ore plant.

Thomas J. McNulty, general land and tax agent for the Anaconda Co., retired Oct. 1, succeeded by **Edward A. Quinn.**

McNulty started in the land and tax department in 1915. He was made land and tax agent in 1956.

Quinn started with the Anaconda Co. in 1936 and became associated with the land and tax department in 1939.

Darrell Gardner, general manager of Magma Copper Co. Mines and the Magma Arizona Railroad at Superior, Ariz., has retired, concluding a work career that started with Magma in 1916.

He rose from contract miner through ranks of level boss, shift, boss, night foreman, general mine foreman, mine superintendent, assistant general manager and general manager.

Gardner is a native of West Jordan, Utah and a graduate of the University of Utah.

Lester S. Hayborne of Cedar City, Utah, has been appointed superintendent of mining for the iron ore mining and processing facility. Heyborne is a native of Parawan, Utah, and has been with U.S. Steel's open pit mining operations in Iron County, Utah, since 1947. He has been mining engineer at the Cedar City operations since 1953.

Bunnell has been with U.S. Steel since 1943, all of the time in personnel and industrial relations work.

Ralph Ebersole, plant manager in Spokane for Pacific Northwest Alloys, Inc., has been named plant manager of Montana Ferroalloys, Inc., at Memphis, Tenn. Both firms are owned by Chromium Mining and Smelting Co., Ltd. Ebersole has been associated with Chromium Mining and Smelting since 1949, and had been Spokane plant manager since 1955.

George Fegan, formerly production manager, will succeed Ebersole as plant manager in Spokane. **John Holcomb,** former plant engineer, will become production manager.

G. Robert Couch has been appointed technical advisor to the vice president, eastern operations, Climax Molybdenum Co. He comes ot his new post from the corporate central planning department of American Metal Climax, Inc., the parent company. Previously he had been assistant to the technical director of the Amco division of American Metal Climax, Inc. He joined Amax in 1957 after fourteen years with the National Lead Co., where he was senior development engineer.

Couch

Couch received his B.S. in chemical engineering from Missouri School of Mines and Metallurgy in 1941. He received his M.S. in chemical engineering from Newark College of Engineering in 1953 by attending night classes.

A registered professional engineer, Couch is also a member of the American Institute of Mining and Metallurgical Engineers, and the American Chemical Society.

NOW THERE ARE FOUR "HDP" PRIMERS

to help you break more rock per shift

Now you can get **all** the economy of non-cap-sensitive blasting agents.

With the introduction of the HDP-5, you now have a complete "family" of Du Pont high Detonation Pressure Primers, especially created to develop full rock-breaking power from lower-priced blasting agents such as nitro-carbo-nitrates, Du Pont "Tovex" water compatible slurry, and prill/oil mixtures.

All four "HDP" Primers contain a high-density explosive which develops a velocity of almost 5 miles/second and a temperature of about 7500°F. This combination gives the very high detonation pressure to develop full energy from non-cap-sensitive products.

There's no nitroglycerin in "HDP" Primers, so they are less sensitive to shock and friction than dynamite primers. There's no headache causing ingredient.

And assembly to "Primacord" or caps is easy to make, through holes in the primers. You can even do it with heavy work gloves on.

Your Du Pont explosives representative or distributor can arrange for you to try out new "HDP" Primers now. Call him for details. Or for a copy of our new bulletin on the subject, write Du Pont, 2446 Nemours Building, Wilmington 98, Delaware. **EXPLOSIVES**

Meet the "HDP" Primer Family

HDP-1

PROPERTIES: Weight 1 lb. • Detonation Velocity 24,000 fps • Highly resistant to water and oil • Dimensions—3" diameter cylinder 2½" long • Two axial holes—1 for "Primacord" and 1 for electric blasting caps or MS delay electric blasting caps • Packed 48 primers per case—48 lbs. net

USE: Recommended for priming all NCN products, "TOVEX" gel, and prill/oil mixtures, bulk loaded or cartridged, in holes of 4" diameter and larger.

HDP-2

PROPERTIES: Weight ½ lb. • Detonation Velocity 24,000 fps • Highly resistant to water and oil • Dimensions—3" diameter cylinder 1.4" long • Two axial holes sized for use with "Primacord" only • Packed 100 primers per case—50 lbs. net

USE: Satisfactory for priming bulk loaded NCN products and prill/oil mixtures in holes of 4" diameter and larger.

HDP-3

PROPERTIES: Weight ⅓ lb. • Detonation Velocity 24,000 fps • Highly resistant to water and oil • Dimensions—1¾" diameter cylinder 3½" long • Single axial hole centered in the primer sized for "Primacord", electric blasting caps and MS delay electric blasting caps • Packed 150 primers per case—50 lbs. net

USE: Recommended for priming all bulk NCN products, "TOVEX" gel, and prill/oil mixtures in holes ranging from 2" to 4" inclusive in diameter.

HDP-5

PROPERTIES: Weight 5 lbs. • Detonation Velocity 24,000 fps • Highly resistant to water and oil • Dimensions—5¼" diameter cylinder 4¼" long • Two axial holes sized for use with "Primacord" only • Packed 12 primers per case—60 lbs. net

USE: Recommended for priming all NCN products, "Tovex" gels and prill/oil mixtures, bulk loaded or cartridged in holes of 6" diameter and larger, under exceptionally severe conditions.

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PERSONALS *(Continued)*

James R. Gronseth has been appointed manager of the hoist department, mining division, Nordberg Manufacturing Co., Milwaukee. In his new position, Gronsbeck will have responsibility for engineering and sales of Nordberg mine hoists. He comes to Nordberg with a background of more than thirteen years experience in mining and construction. Gronseth has had considerable experience with all types of mine hoists.

Gronseth

Formerly a mechanical engineer for Inland Steel Co., Gronseth was in charge of all mechanical, electrical and structural work for the iron ore department since 1953.

Gronseth is a graduate of the Michigan College of Mining and Technology with a B.S. degree in mechanical engineering. He also spent five years with Roland C. Buck, Inc., Engineers, a heavy construction company in Superior, Wis.

Ira A. McClure of Riverton has been appointed by Acting Gov. Jack Gage to the state board of mines. He succeeds **Ervin E. Dempster** of Jeffrey City, who resigned.

McClure's term will run through March 1, 1965. He is a master mechanic for the Lucky Mc Uranium Mining Co.

George E. Kruger, vice president and technical director, mining industry, of the Chase Manhattan Bank, has been elected a director of Inspiration Consolidated Copper Co. He will fill the vacancy caused by the recent death of **Leon H. Johnston.**

Charles D. Michaelson has been appointed vice president, mining, and **Gordon B. Russell** has been named treasurer and comptroller of Kenncott Copper Corp.

Michaelson has been general manager, western mining divisions, with offices in Salt Lake City, since 1955. He has had responsibility for the company's four divisions in Utah, Nevada, Arizona and New Mexico. A graduate of the Colorado School of Mines, Michaelson has worked in various capacities for mining companies in the U.S., Cuba, Mexico and Bolivia. In 1948, he was named general superintendent at Kennecott's Chilean subsidiary, Bradon Copper Co. He was named general manager in 1952, and vice president and director in 1954. The following year he returned to the U.S. as general manager of Kennecott's western mining divisions.

Russell, Kennecott's comptroller since 1952, will continue in this post in addition to his new duties as treasurer succeeding **James R. Simpson,** who has been named assistant secretary of the corporation.

Samuel G. Reynolds, electrical superintendent at the Great Falls Smelter of the Anaconda Co. since 1958, has been assigned to the central engineering office in Butte.

Walter Titus, Jr., assistant superintendent of maintenance at the Great Falls shops of the Anaconda Co., has been promoted to electrical superintendent at Great Falls to replace Reynolds.

Reynolds joined Anaconda in 1950 and first worked as an electrical engineer in the electric shop. He served in all supervisory capacities until January 1, 1961 when he became electrical superintendent.

Titus started with the company in 1952 as an electrical engineer. On January 1, 1958 he was named as assistant superintendent of the electrical department and in March 1960 was moved to assistant superintendent of maintenance of the shops.

Richard D. Chapman has been named chief of the Copper & Brass Research Association's new office in Detroit. The office has been established to further market development and promotion of the copper metals in the automobile industry, and to expand the copper mill industry's engineering and metallurgical services in this highly important field.

Chapman is exceptionally well qualified for the new Detroit post. He was formerly assistant chief engineer, basic science research department, Chrysler Corp. He has served that company with distinction for 25 years in various engineering capacities. His assignments covered metallographics, X-ray, diffraction, dilatometer studies, and other technical investigations. In 1956, he was appointed managing engineer for all research activities in ferrous and nonferrous metallurgy. The following year he was named assistant chief engineer of this department and two years later, 1959, he was appointed to his most recent position.

Chapman received his bachelor's degree from Michigan State University and in 1939 received a master's degree in mechanical engineering from Chrysler Institute of Engineering. An active member of many notable technical societies, he has held chairmanships and vice chairmanships in the American Society for Metals, the American Institute of Mining, Metallurgical and Petroleum Engineers, the Society of Automotive Engineers, and the American Society for Testing Metals. He has also co-authored a number of published technical papers on metallurgical subjects.

Eldon McNichol, a 1959 graduate of Montana State College, Bozeman, has been named assistant superintendent of maintenance of shops at the Anaconda Co., Great Falls, Mont. He succeeds **Wally Titus** who was appointed to electrical superintendent.

McNicol specialized in mechanical engineering at Montana State College.

J. B. Simpson, A.C.S.M., M.I.M.M., M.I.MIN.E., mining consultant to Anglo-French Exploration Co., Ltd., has been elected president of the Institution of Mining and Metallurgy for 1962-63.

Simpson has been a member of the Institution since 1944. He served on the Council from 1951 to 1958, and has held office as a vice president since 1959. He has been on the management committee of the Benevolent Fund for the last eleven years, as chairman since 1956. Simpson is also a governor of the Camborne School of Metalliferous Mining.

J. J. Daly has been assigned to the U.S. as Atlas Copco technical representative, international Swedish company manufacturing pneumatic equipment for mining, construction and industrial applications.

Daly will work from Paramus, N.J., main office for the U.S. eastern division. He will provide technical assistance in the application of Atlas Copco rock drilling equipment and compressors.

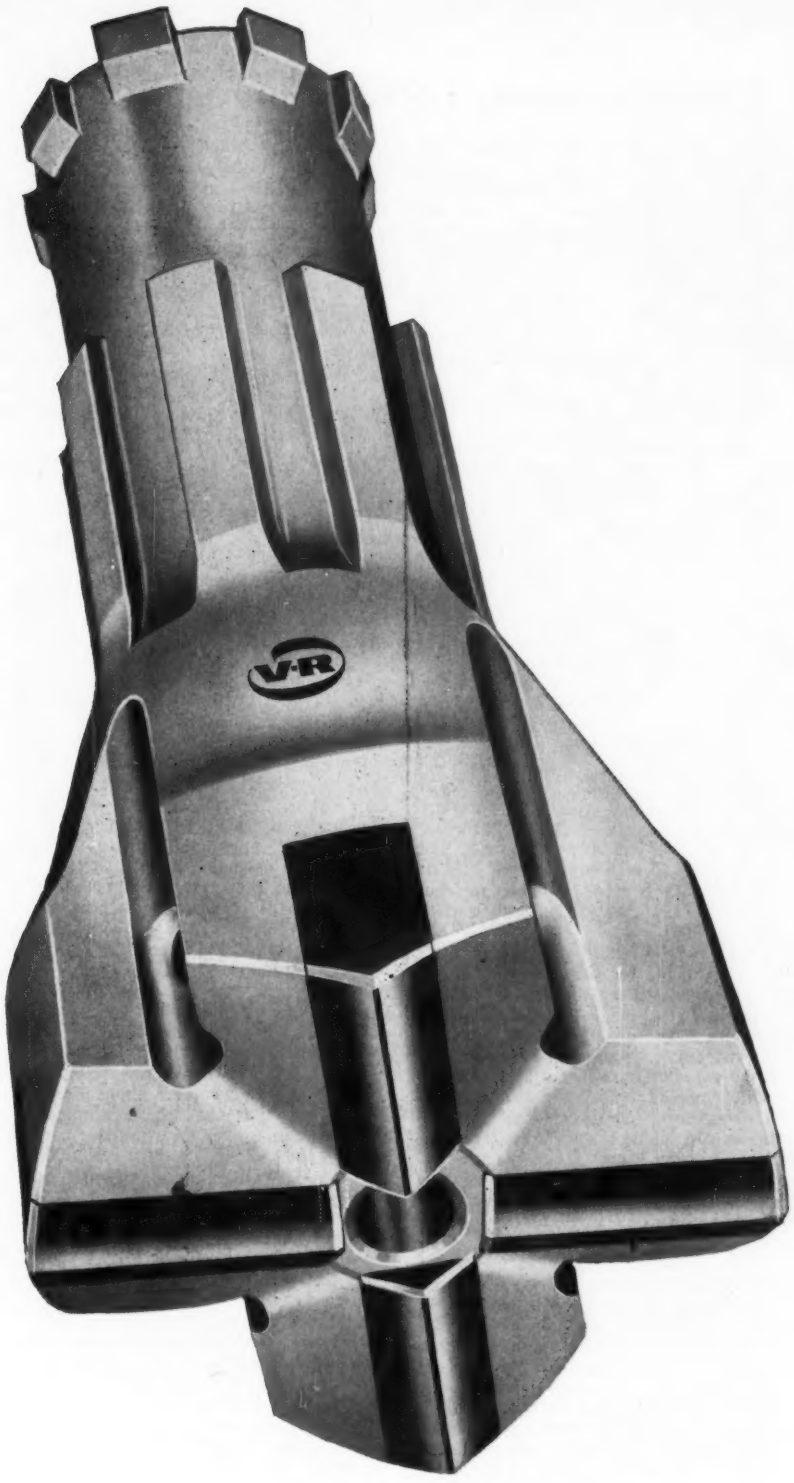
A graduate of the University of North Dakota with a degree in mining engineering, Daly was an associate professor there in the School of Mines for a number of years, and was most recently with the Minerva Oil Co. of southern Illinois.

Robert C. Hills has been elected president of Freeport Sulphur Co. He succeeds **Charles A. Wright,** who is now vice chairman of the board. Hills has been a director and executive vice president of Freeport since 1955. He joined the company in 1934 as an assistant chemist at its Grand Ecaille sulphur mine in Louisiana. He was named assistant to the president in 1947, and elected a vice president in 1950.

Hills

As executive vice president, Hills has been in charge of Freeport's five sulphur-producing properties, and he was responsible for the construction and start-up in 1960 of the world's first offshore sulphur mine at Grand Isle, La. He is also president of Freeport Nickel Co., a subsidiary which created a revolutionary metallurgical process to extract nickel and cobalt from Cuban ores, and had successfully begun production when its Cuban properties were seized by the Castro government.

A native of New Orleans, Hills was graduated from Tulane University, and received his master's degree at Cornell. He is a member of the New Orleans Academy of Sciences, the American Institute of Mining, Metallurgical and Petroleum Engineers, the American Chemical Society, the American Mining and Metallurgical Society, and the Council on Foreign Relations.



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Canadians Discuss Development, Foreign Investment

A MULTI-MILLION dollar development program for the major zinc-lead deposit of The Consolidated Mining and Smelting Company of Canada Limited at Pine Point on the south shore of Great Slave Lake will be touched off by long-awaited construction of a 437 mile railway to the area.

As noted by W. Keith Buck, Chief, Department of Mines and Technical Surveys, Mineral Resources Division, in September in Edmonton at the Second National Northern Development Conference, "this deposit constitutes one of Canada's and the world's largest known reserves of zinc and lead."

The conference, which also heard leading Canadian mining and metallurgical leaders, was jointly sponsored by The Alberta and Northwest Chamber of Mines and The Edmonton Chamber of Commerce. Buck's paper dealt with metallic and non-metallic mineral resources of Northern Canada.

Buck pointed out that further development of the major deposit depends on the construction of a railway from railhead at Grimshaw on the Northern Alberta Railway to Pine Point, a distance of 437 miles. Subsequently, it has been reported from Ottawa that the Commons has given unanimous approval in principle to spend up to approximately 85 million dollars for the line.

Regarding the deposit, Buck related that "exploration during 1948 to 1954, combined with earlier exploration in 1929 and 1930, outlined a mineralized belt about 22 miles long and from two to four miles wide, containing an indicated reserve of several million tons in the shallower parts of the belt, with additional large reserves in the deeper parts."

He added: "The grade of the ore was found to vary widely through the mineralized zones; large bodies were outlined averaging more than 10 per cent combined lead and zinc. The lead and zinc ratio was found to be about 1 to 4 on the average, and in the higher-grade orebodies as high as 1 to 2. The exploration program was suspended in 1954, sufficient reserves having been proven."

In pointing out that further development awaited railway construction, he said in part:

"Negotiations between the federal government and Cominco, in respect to the railway, have been underway for some time. Cominco is anxious for the commencement of construction inasmuch as additional supplies of raw materials will soon be required to maintain refinery production at Trail, British Columbia. The principal alternative to a supply from Pine Point is the importation of zinc and lead concentrates from abroad."

He estimated that capital investment for the Pine Point development will be in the order of 20 million.

Gordon Robertson, Deputy Minister of Northern Affairs and National Resources and Commissioner of the Northwest Territories, called attention to the dependency of resource development on availability of transportation facilities and suggested that while much is being done, substantial progress will be realized only over the long term. For example, he noted, the decision has been taken to proceed with the Pine Point railway and detailed location surveys are now under way, but this will not show in the base metal statistics for another five years.

Canada must look to the foreign market for its northern minerals, but faces "intense competition," according to W. Keith Buck, Chief, Department of Mines and Technical Surveys, Mineral Resources Division.

He said in part regarding markets: ". . . Of course, the existence of markets is vital to northern mineral exploration and development. And, since Canada is small in the population sense, it is to the foreign market that we must look. At this particular period . . . we are the world's fourth largest trading nation and in the export field, 31.8% of our Canadian exports (1960) consists of crude and semi-processed minerals. If fully manufactured mineral products are included, this figure rises to 41.6% of total exports. The role of minerals and mineral products in our national exports has been an increasing one, rising from 14.6% in 1926, to 35.6 in 1956 and to 41.6 in 1960. . .

"However, the expansion of our export trade must not be taken for granted. Of late, our country has been made increasingly aware that it faces intense competition in the export market. We have no monopoly on mineral resources. Insofar as nothern Canada is concerned, this competition comes not only from other nations but also from domestic mines and smelters more advantageously located in the southern parts of the various provinces. The existence of this competition has its influence on both the expenditure of funds for exploration and on resource exploitation."

Buck concluded his paper with the following summary:

"Although we must be realistic about the possibilities of northern mineral development and exploitation and give due weight to the various geographic, engineering and economic difficulties involved in development and exploitation, we must not just sit back and wait for time to solve these difficulties or for an increase in world population to create additional markets. One positive action that can be taken is to increase our basic knowledge of the geological, geophysical and mineralogical environment of northern Canada. This, indeed, is essential to future exploration and development.

"The value of Mineral production in Yukon and Northwest Territories now (1960) amounts to about $36 million, only 1.4 per cent of the total value of the mineral production of all Canada. In both absolute and relative terms, the share which the two territories have of Canadian mineral production has been declining since the peak year of 1954. The outlook for the immediate future is that of further decline, again in both absolute and relative terms. The decline which has and will probably continue to take place in the two territories has occurred despite the relatively large expenditures on exploration compared with the relatively small value of mineral production. The level of exploration expenditure in the two territories in respect to value of production, for the past ten years, has been from 2½ to 10 times as great as the level of expenditure for all Canada, indicating very clearly the relatively large amount of effort devoted to mineral exploration in the territories, in comparison with the probable return on the exploration dollar expended."

A relatively small project in the Yukon Territory will bring Canada back into the ranks of world tungsten producers, also according to Mr. Buck.

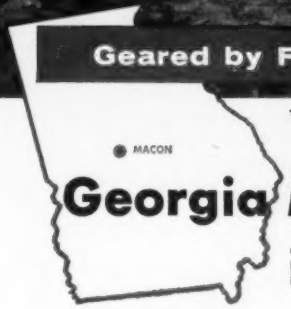
He made reference to the tungsten deposit of Canada Tungsten Mining Corporation Limited and arrangements for its development in his paper on metallic and non-metallic mineral resources of Northern Canada, stating:

"Although the project is relatively small, it is of considerable importance to Yukon Territory and it will bring Canada back into the ranks of world tungsten producers. Production is planned at the rate of about 100,000 tons per year, from which it is expected to recover 200,000 units of WO_3. At present market prices ($15.75 a unit on April 27, 1961 E & M J) the concentrate will have a value of about 3 million dollars. Most of the concentrate will be shipped to the United States which is deficient in tungsten resources. As Canada's imports of scheelite in 1960 were just under 38,000 units of WO_3, it is not expected that Canada Tungsten will move immediately into the Canadian market where trade patterns are well established. The capital cost of the project will be in the order of 6 million dollars; during the construction phase, from 100 to 120 men will probably be employed and when the mine is in production, its operation will require about 80 men."

He observed that Canada Tungsten Mining Corp., holds 84 unpatented mining claims just east of the Yukon-Northwest Territory boundary and 135 miles north of Watson Lake. The claims cover some 4,280 acres on the west slope of Flat River Valley.

Alberta government Minister of Labour Raymond Reierson has indicated that steps eventually may be taken to require complete or partial processing of

The Model C Tournapulls that cut through overburden for the Georgia Coating Clay Company feature 8V-71 GMC engines, Fuller L-1220 Transmissions and pull 20-yard pans.



Georgia Mining Company uses L-W's in getting down to KAOLIN

To get to the pure white kaolin they mine for the production of china and paper, the Georgia Coating Clay Company of Macon has to strip off anywhere up to ninety feet of overburden.

Two LeTourneau-Westinghouse V-Power Model C Tournapulls are kept on the move throughout the company's area to strip off the overburden of red clay, fuller's earth and gumbo. Used in continuous operation at many mine locations, these machines lay open the rich veins of kaolin so that shovels and trucks can bring out the pure white clay.

Arthur Yates, Shop Foreman for Georgia Coating Clay, is more than satisfied with his new V-Power C-Pulls. "This C with the 290 hp V8 engine outperforms anything we've ever seen. Naturally we specified the Fuller L-1220 Transmission—we've been using Fullers for quite some time, and have nothing but the best to say about them. The L-1220 gives us an even flow of power from the big V8 engine, and we get no vibration. And then the Countershaft Inertia Brake built into the Fuller Transmission provides quick upshifts for constant operation at peak horsepower, while the Pressure Lubrication and Filtration System assures us of full transmission oil flow and keeps the gear lube clean. We like the Fuller; it's a simple, heavy-duty transmission that has given us nothing but the most reliable service."

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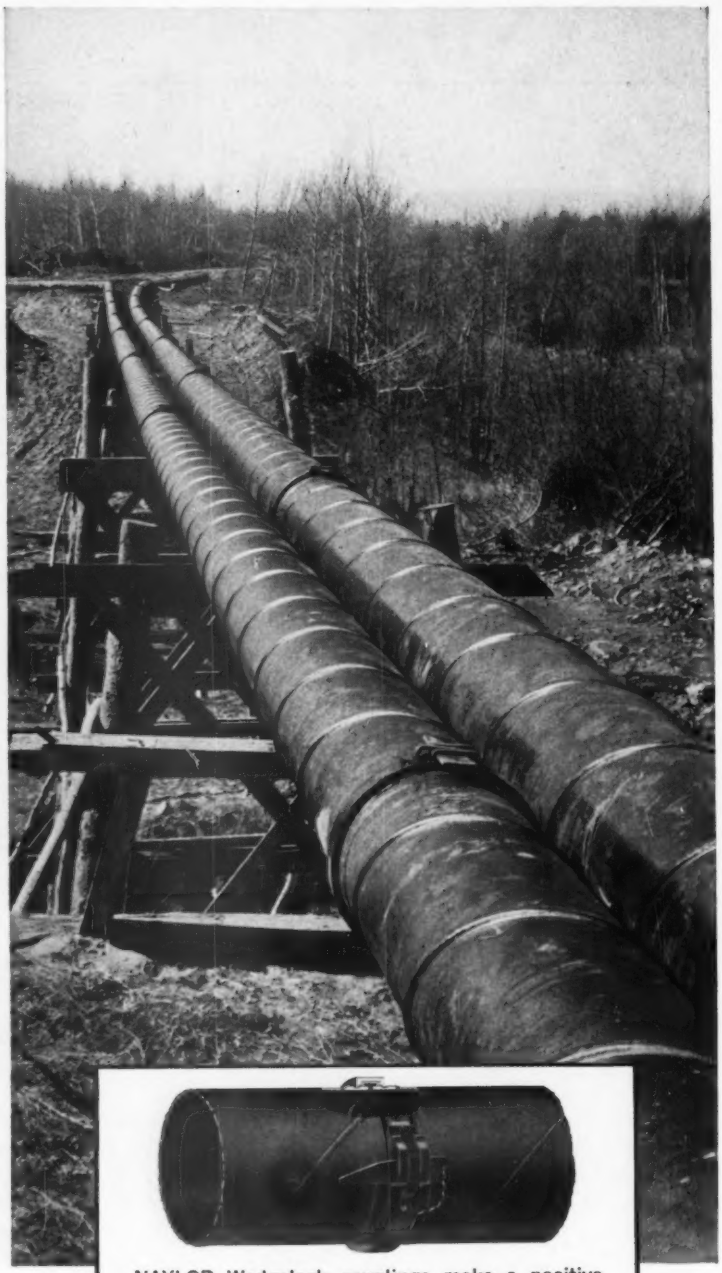

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NAYLCR Wedgelock couplings make a positive connection securely anchored in standard weight grooved ends.

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Canada's natural resources within Canada.

Reierson served as Chairman of a panel dealing with "the importance of increasing the value of Northern Resources by treatment in Canada." Reierson stated in part:

"There is no question but that the provision of more employment opportunities for Canadians is one of the major tasks confronting government and business in the decades ahead. And it follows therefrom that we are more than anxious to process our natural resources of field, mine and forest to the maximum degree economically possible.

"The day is past when we were satisfied merely to produce the raw materials for processing and for final manufacture in other countries. Whether the day has yet arrived when we can be assured that there is complete justification for insistence on complete or partial processing within Canada's borders is another question altogether. But there is no question but that 'the winds of change' which have made other nations conscious of the need for industrial developments within their borders have swept across Canada as well. We look in the decades ahead, to a more consistent development of our own industrial processing facilities. We certainly hope that the proportion of processing and manufacturing facilities, as compared with primary resource production facilities, will improve measurably from now on."

He said that "it may be in the national interest to press for, by the various means and devices open to governments, and in keeping with established laws of economics, measures of insistence or assistance to ensure that maximum treatment of our raw products is within our borders," adding:

"The value added by processing locally the mineral resources of the Yukon and Northwest Territories in 1959 was close to $28 million—a substantial proportion of the total value of minerals produced ($38 million). The value added by the manufacturing activities already established in Northern Canada . . . is over to $30 million out of a total value of manufacturing of $76 million. These activities together gave direct employment to more than 4,000 persons who kept $16 million in circulation in the area. There is no doubt as to the importance to Canada of increasing the value by treating and processing to the maximum our nothern resources within Canada."

Development of metal extraction processes will center increasingly on methods geared to increased automation and reduced labor costs.

This view was expressed by Dr. Frank A. Forward, professor, and head, Department of Mining and Metallurgy, University of British Columbia, Vancouver, in a paper on "New Techniques of Metal Extraction."

In describing various processes, he said it was impossible to suggest how the principles or techniques can be applied to deposits in the north without having data for a specific operation.

Dr. Forward noted that one of the

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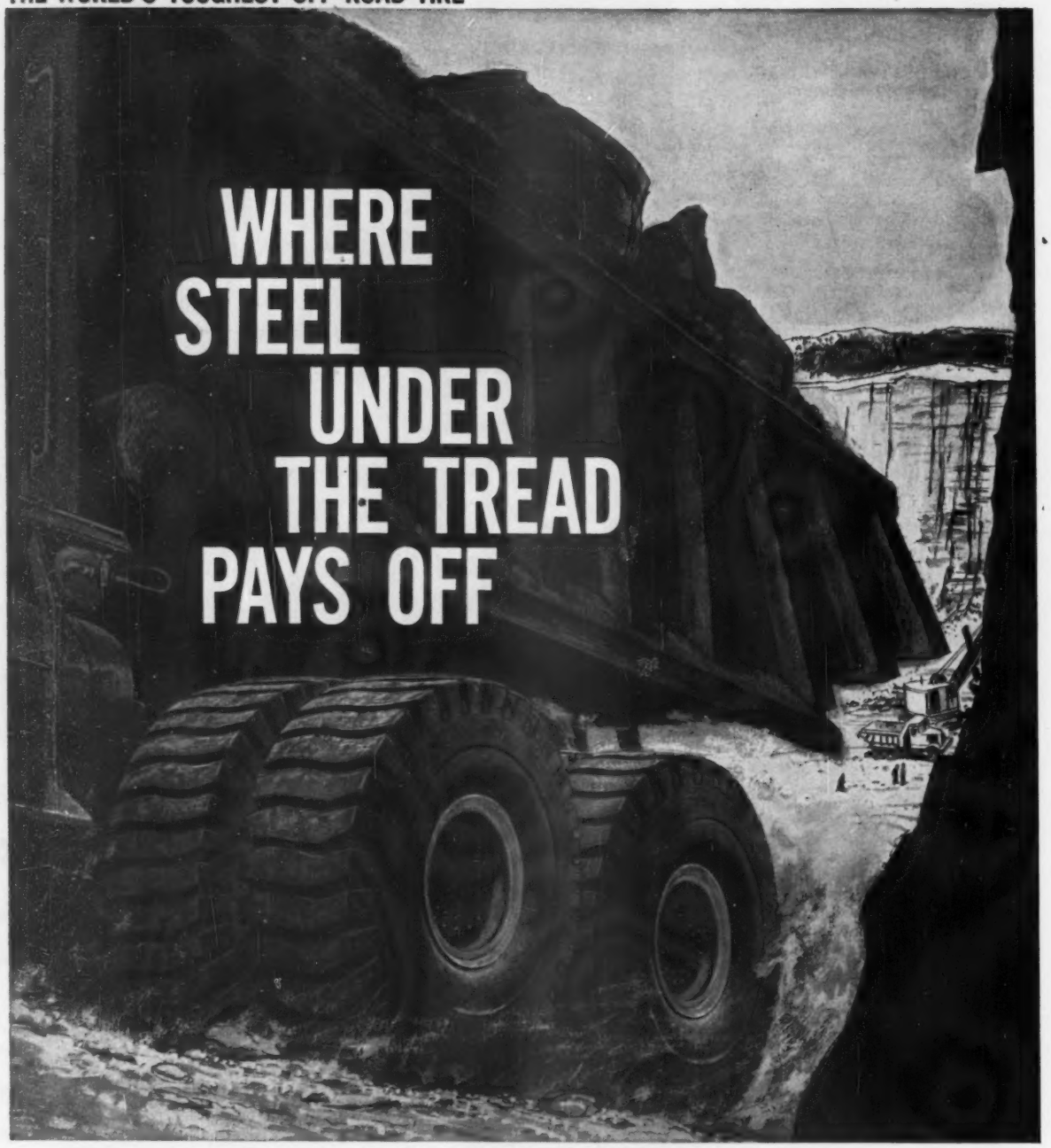

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factors having important bearing on the selection of processes "is the cost of labour and the related aspect of capital cost that can be justified to increase automation and reduce the operating labour cost." He elaborated as follows:

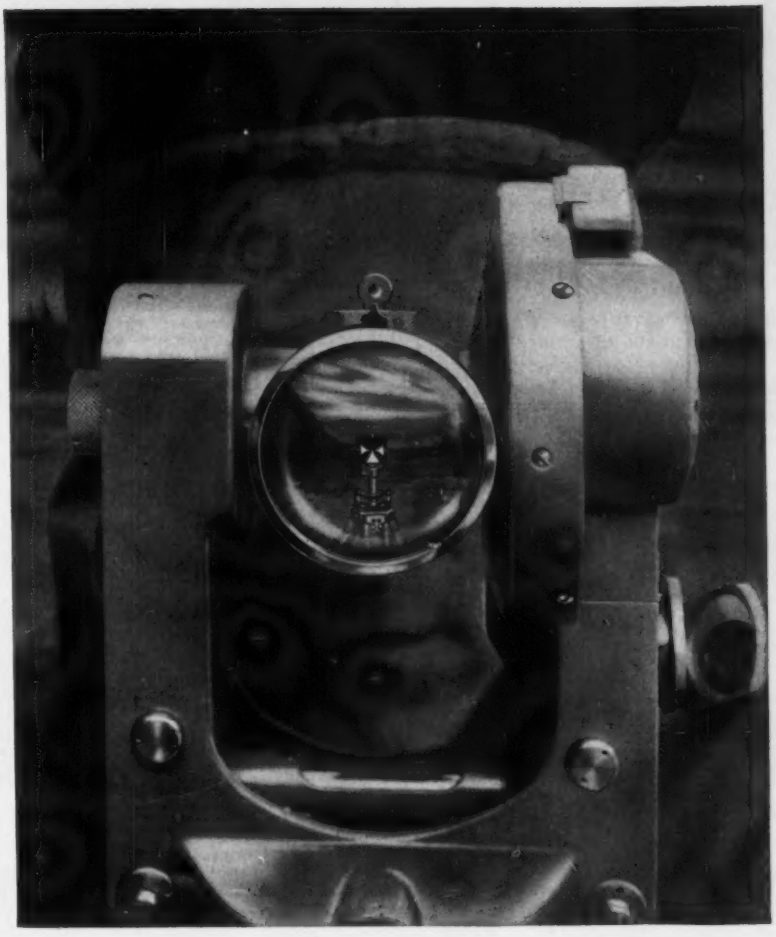
"In this connection it might be observed that handling coarse solid materials is difficult and expensive and almost invariably requires operators to load and unload cars, to tend belts, to manipulate storage facilities, to charge reaction vessels, etc. Thus to reduce labour costs the most effective method is to use a process that involves fluids such as pulps, solutions, or vapours that can be handled in pipe-lines, continuous reactors and closed systems. Fluids can be easily sampled, transported, stored and are thus ideally suited for automation. Thus I believe that the development of metal extraction processes will trend toward the introduction of fluid systems wherever this is possible."

He said that some of the newer processes that incorporate these concepts are:

1. Sherritt Gordon Nickel Refinery—In this plant, which uses hydrogen produced from natural gas to reduce nickel and cobalt under pressure from aqueous solutions, the nickel-copper-cobalt concentrate is leached with ammonia (also from natrual gas) and compressed air. The energy requirement is moderate and is less than for smelting and electroytic refining; the concentrate is pulped with leach solution when it enters the plant and every operation is carried out on the fluid pulp except the final drying and briquetting of the nickel and cobalt powders. Advantage is taken of low cost energy and of automation in a plant located in a flourishing chemical community in Edmonton.

2. Aluminum Sub-halide Process—This process, which is being tested on a large pilot plant scale—6,000-8,000 tons per year of aluminum—involves direct smelting of impure bauxite ore to produce an alloy of iron, silicon, and aluminum. This is reacted with aluminum trichloride ($AlCl_3$) to produce hot volatile aluminum subchloride (A1Cl) which, on cooling, produces A1 metal and $AlCl_3$ which is recycled. The energy required is about the same as in the conventional electrolytic process but the direct treatment of ore and the use of fluids (AlCl and $AlCl_3$ vapours) is said to reduce plant costs and operating labour requirements.

3. Imperial Smelting and other processes for lead and zinc—The treatment of complex lead-zinc ores has always presented difficulties and metallurgists have long been attracted by the theoretically feasible process of producing zinc in a blast furnace instead of a costly retort or by electrolysis. The Imperial Smelting Company has built at Swansea and is building in Australia and other countries a blast furnace that is carefully designed and controlled and which produces zinc vapour at the top of the furnace and molten lead in the smelting zone. The zinc vapour is condensed in a spray and bath of molten lead from which, on cooling, the zinc separates and is skimmed off. Here again the use of fluid systems affects notable econo-



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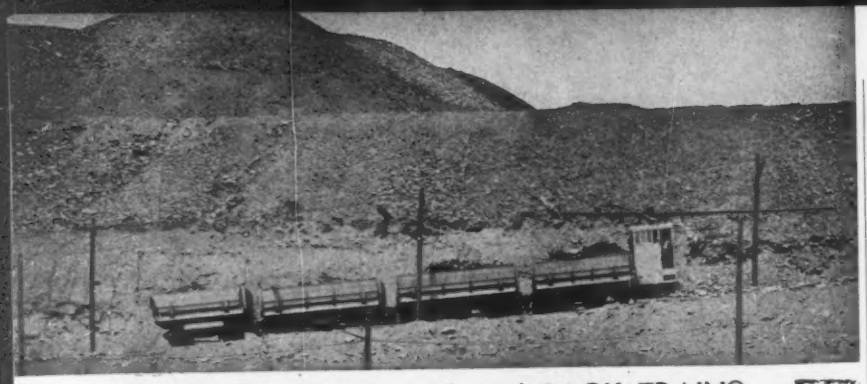

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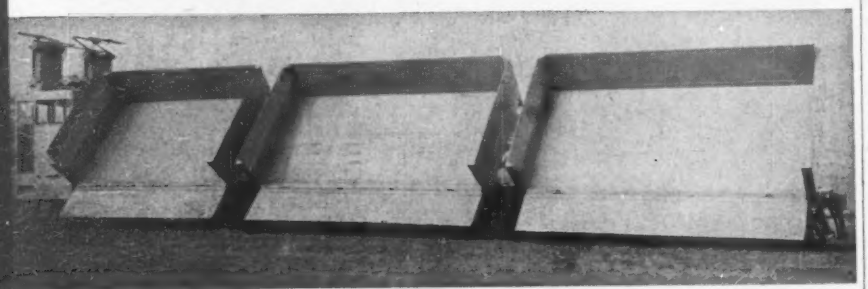

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mies. At Duisburg, Germany, a new electric furnace operates continuously to produce zinc vapour from zinc oxide—the reductant is carbon and electrical energy is used efficiently only to maintain temperatures. It might be mentioned that as far as zinc production is concerned the traditional distillation process using carbon is still the cheapest method to install and operate where low cost fuel is available.

4. Lead Amine Leaching—Traditionally lead has been produced from sulphide ores by roasting to remove the sulphur, smelting to a lead-silver bullion and desilverizing and refining by electrolytic or chemical processes. An interesting process has been devised recently which involves oxidizing the lead sulphide concentrate in an aqueous solution with compressed air at about 90°C to convert it to lead sulphate. The lead sulphate is dissolved at room temperature in a solution of diethylene triamine in water, the silver, etc., remaining in an insoluble residue. The lead amine solution is then treated with CO_2 in a tower to produce basic lead carbonate which is readily reduced at low temperature with coal or other carbonaceous material to produce very high purity lead. The amine is regenerated with lime. This process, not yet tried on a commercial scale, gives excellent separations and with the exception of the final reduction of lead carbonate employs only fluids at relatively low temperatures and is thus well suited for automation.

5. Solvent Extraction—One of the recently instituted procedures for separating and recovering metals from solutions is based on the fact that some metals form compounds with certain organic materials that are soluble in kerosene. Upon agitating the solution of metal salt in the presence of the kerosene-organic layer the metal enters the layer which floats on the surface of the water and is skimmed off. This can be used in any number of vessels in series and a complete separation of metal effected in the kerosene-organic, which is then treated to recover the metal and regenerate the organic material. This procedure, though fairly costly, can be completely automated and can effect separations that would be otherwise almost impossible.

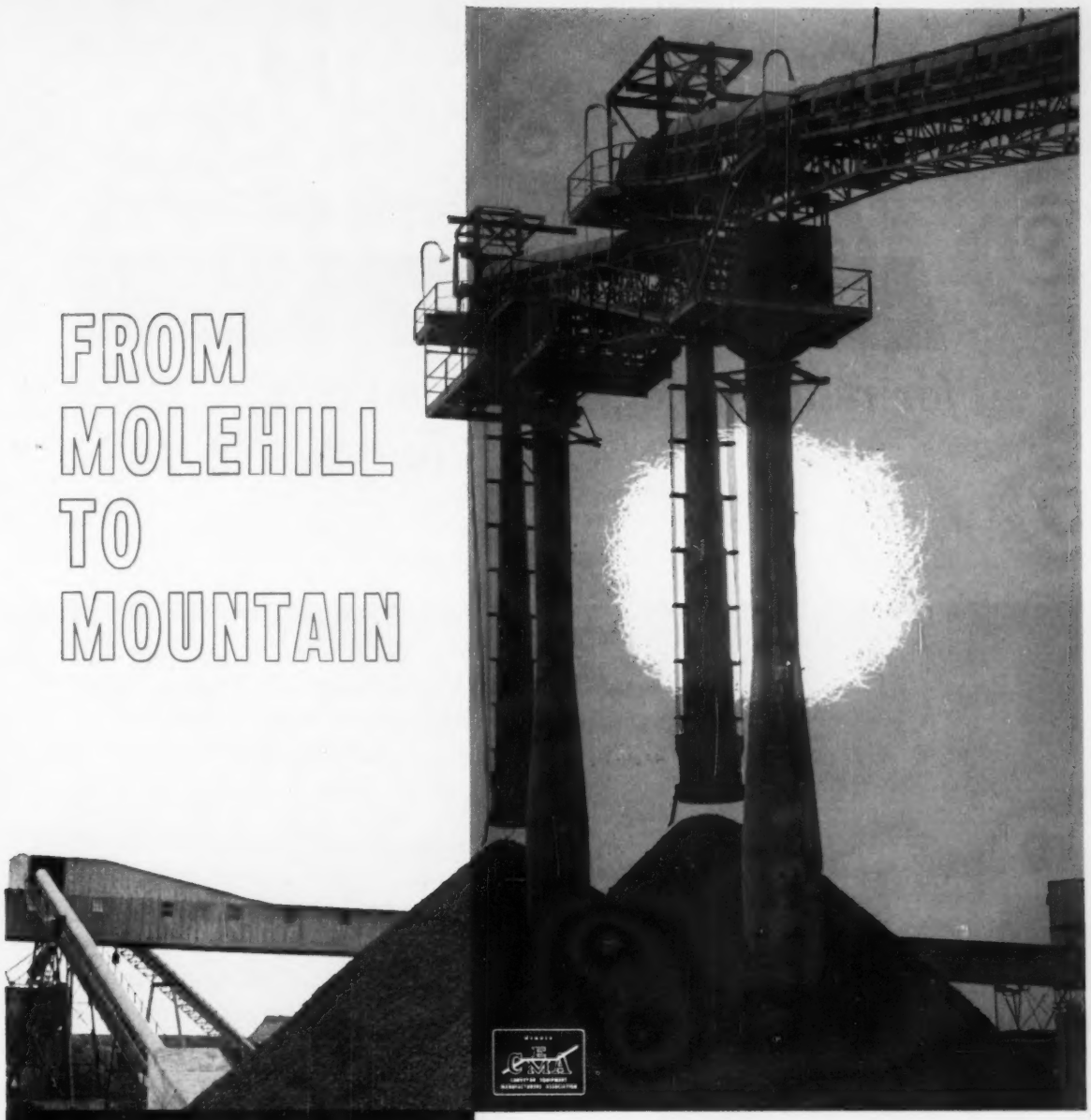
Forward noted in his paper that most of the metal-producing processes are more or less complex chemical operations that require a high proportion of skilled labour, adding:

"For this reason, other things being equal and sometimes in the face of other factors, there is a strong inclination to locate metal-extraction plants in what might be called a 'chemical community' where there is at hand a large pool of technicians and others familiar with this type of industry . . ."

V. C. Wansbrough, vice-president and managing director, Canadian Metal Mining Association, Toronto, has warned that nationalist regulations which deter foreign financial participation in development of Northern Canada's mineral wealth "can rebound dangerously to our disadvantage."

The importance of foreign capital and

FROM MOLEHILL TO MOUNTAIN



A stack piling operation that grows from a molehill to a mountain. Bulk Systems conveyors move tons of shale daily at the Huron Portland Cement Company's Alpena, Michigan Plant—the worlds largest cement producing facility.

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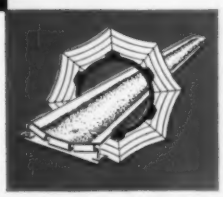

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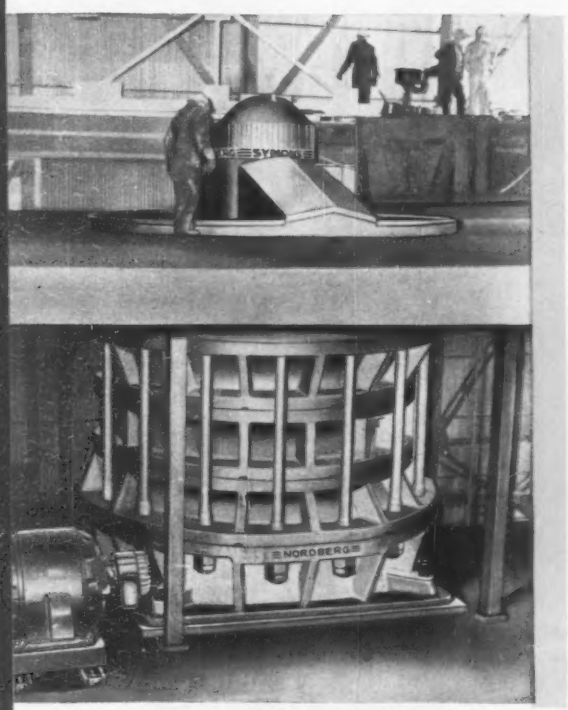

FOR PRIMARY CRUSHING OF MOLYBDENUM

This 60″ Symons Primary Gyratory Crusher has seen several years of service in the primary breaking of "moly" ores in Colorado. Other heavy duty Symons Gyratory Crushers are built with 30″, 42″, 48″, 54″ and 72″ feed opening widths and for capacities to 3500 or more tons per hour.

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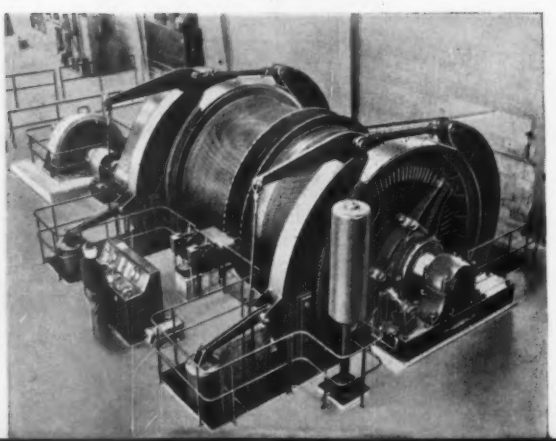
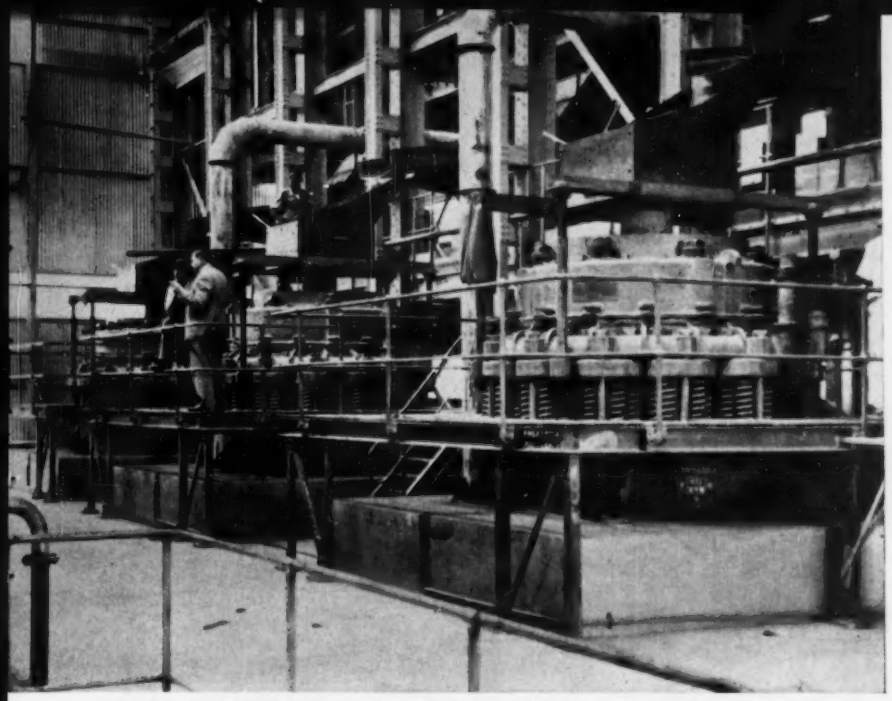


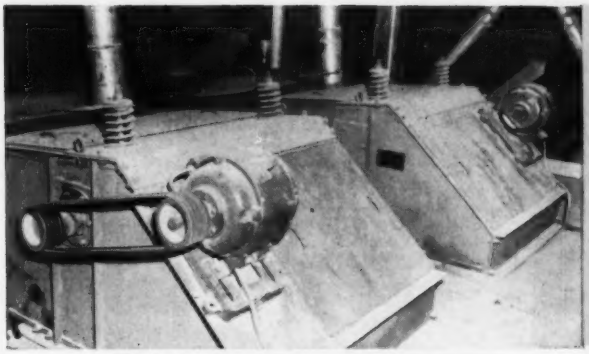
FOR HOISTING IRON ORE

Nordberg Mine Hoists for men and material are built in both conventional drum types as well as friction types . . . for push-button semi-automatic, fully automatic or manual control. Shown is a typical conventional double drum hoist.



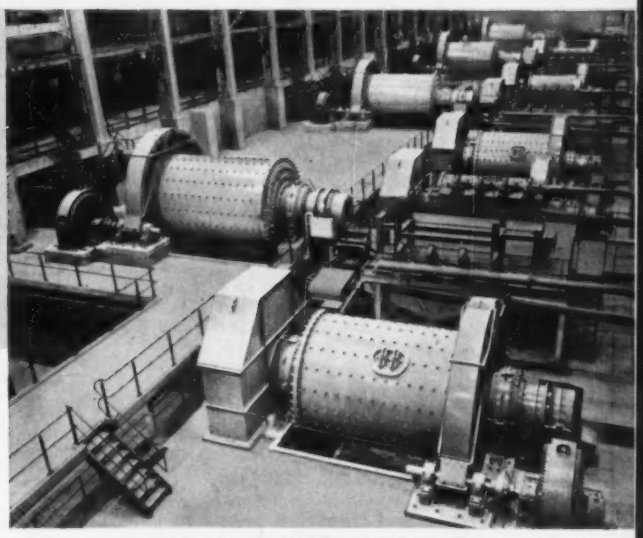
FOR FINE REDUCTION CRUSHING OF COPPER

These three Symons Cone Crushers are serving a Northern Rhodesian copper mine installation. Used for low cost, continuous production of quality products, Symons Cones are first choice of major producers the world over, in capacities to over 1500 tons per hour.



FOR SCREENING URANIUM ORE

These two 4′ x 8′ Symons Rod Deck Screens serve a large uranium processing operation in Canada. Other Symons Vibrating Screens are built in a wide range of types and sizes to handle numerous ore and mineral separation jobs from scalping to fine screening.



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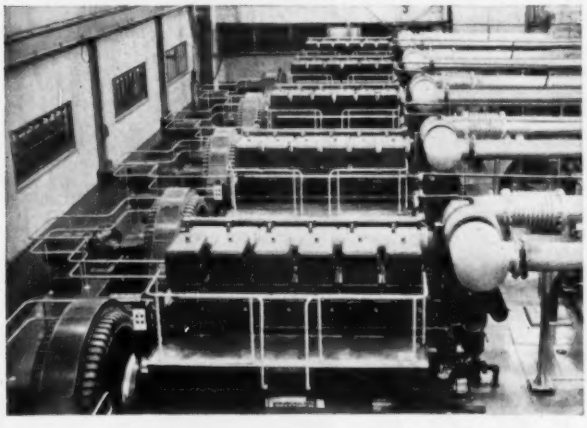
Shown are but a few of the many Nordberg Grinding Mills being used to reduce hard, abrasive taconite iron ore to the fineness of flour. Nordberg mills include Rod, Ball, Pebble, Tube and Compartment types, in sizes to 13′ in diameter and up to 50′ in length.



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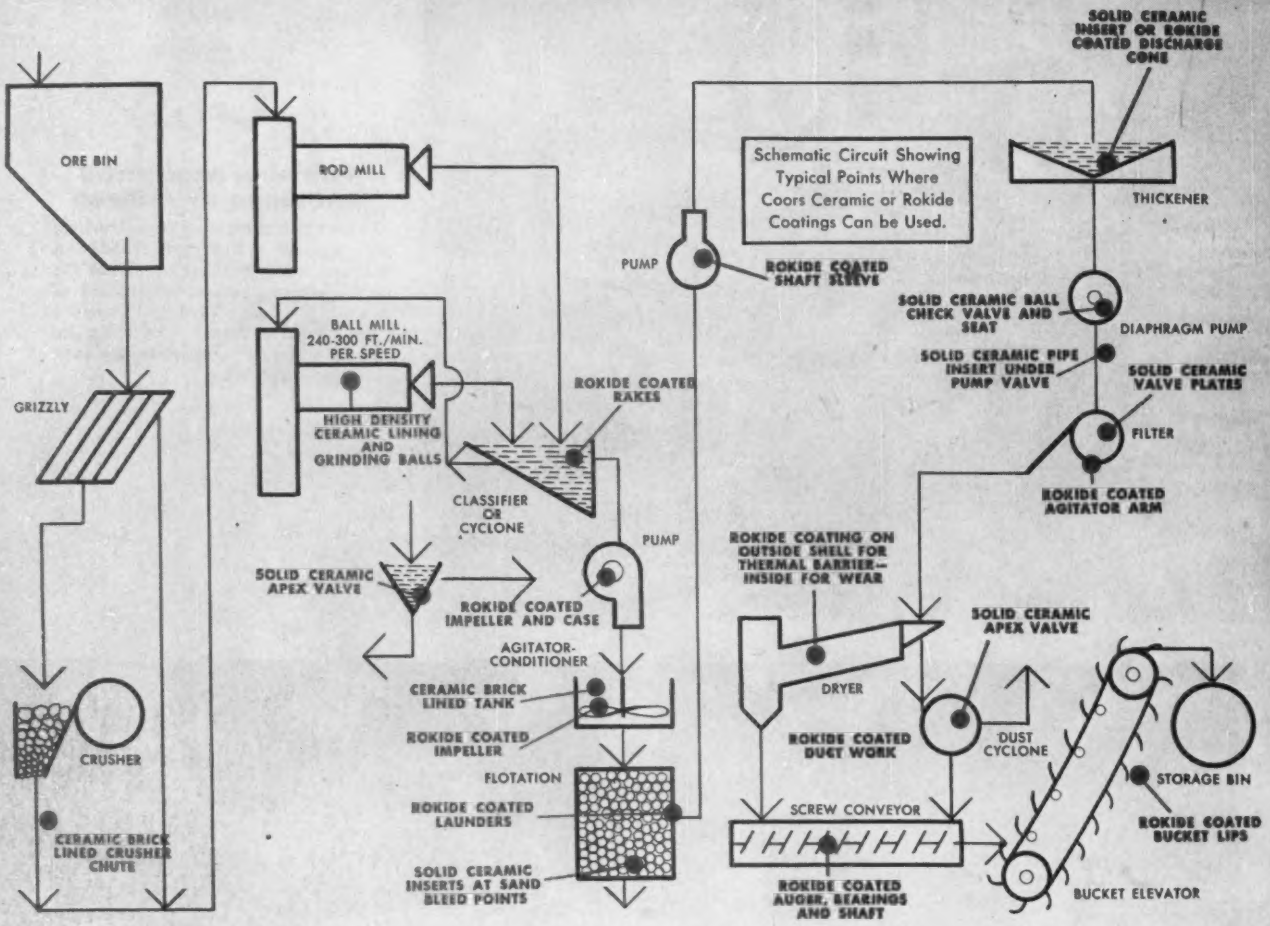

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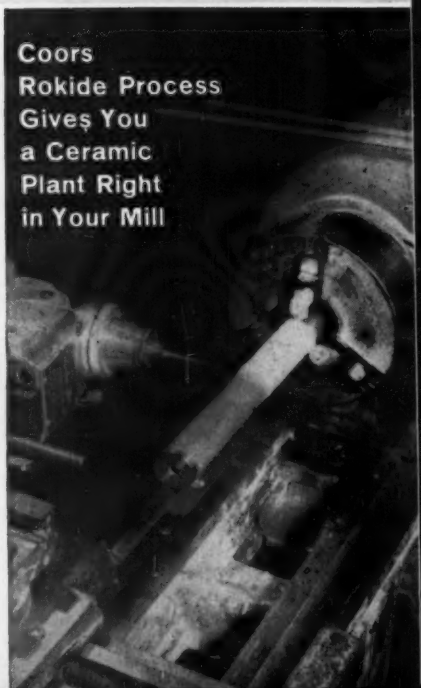

Wansbrough (*Continued*)

favorable political climate in that regard received emphasis also in an address by Charles McKelvie, Manager, Underwriting Department, James Richardson & Sons, Investment Dealers, Winnipeg, Manitoba. Said McKelvie:

"To tap the great resources of Canada's great northland, we must first tap the resources of the great corporations of the world equipped to do the task . . ."

In discussing finance, Wansbrough said in part: ". . . There has grown up in this country in the last few years a strong nationalist sentiment which to my mind calls for a somewhat closer analysis than it usually receives. One mark of it is an increasing and uneasy awareness of the extent to which companies operating on our natural resources are owned by others than Canadians. There is a feeling that ownership is slipping away from us and that steps should be taken to reverse this trend."

He called attention to a condition in federal regulations that a permit to produce or to operate an ore body will be granted only to a Canadian citizen or to a company incorporated in Canada, beneficially owned to the extent of 51% by Canadians, and listed on a recognized Canadian stock exchange.

In questioning the wisdom of this, Wansbrough warned:

"Insofar as it encourages Canadians to invest in the risky but basic business of helping to develop Canadian resources, it is of course admirable. Insofar as it acts as a deterrent to others, it can rebound dangerously to our disadvantage. Many will have noted the reaction in the United States and elsewhere to this requirement; a novel one in this country. I strongly question the wisdom or desirability at this particular time in our country's history of raising roadblocks in the path of those who are willing and anxious to help us develop our mineral wealth.

"Certainly, if similar regulations had been in force ten years ago, the iron ore of New Quebec and Labrador, to take a single example, would still be in the ground."

"Mexicanization" Moves Still Under Discussion

NEGOTIATIONS on two big "Mexicanization" deals in the mining industry are marking time, pending official clarification of benefits to foreign companies which take on Mexican partners as majority stockholders.

A spokesman for the Banco Nacional de Mexico, S.A., which is negotiating the purchase of control of American Smelting & Refining Company's newly-consolidated Mexican subsidiary, Compañia Minera Asarco, S.A., told E&MJ that talks "will probably move a little slower than was expected."

He said that "certain things must be clarified" with respect to the Mexicanization law, and added that negotiators had not been able to resolve various points to the satisfaction of either Asarco or the bank.

A spokesman for the Banco de Comercio, S.A., reported that negotiations for purchase of 51% of Minera Frisco, S.A., subsidiary of San Francisco Mines of Mexico, Ltd., "are awaiting a decision by the government."

The Mexicanization law published last February provides for tax reductions for companies in which Mexicans hold at least a 51% controlling interest. But full details of the law's application have not been spelled out, though its general workings have been aired in conferences of government officials with representatives of private industry.

A Sept. 1 deadline for compliance with the law had been expected, but as yet no deadline has been established.

Carolina May Push Hydraulic Phosphate Mining

HYDRAULIC PHOSPHATE MINING may get North Carolina backing if State Geologist Jasper Stuckey turns in a favorable report. Two years ago, Bear Creek Mining Co. and a subsidiary of Sun Oil Co. mined 3500 tons of phosphate by forcing water down one shaft and collecting slurry through a second. Although the method was successful, mining was discontinued because of lack of sufficient financial backing and inability to obtain land leases.

Stuckey was asked by the State Board of Conservation and Development to make a preliminary study and submit recommendations on a proposal that the state spend $60,000 to prove the feasibility of hydraulically mining phosphate desposits in Beaufort County.

Dan Cameron, chairman of the board's Mineral Resources Committee, said that the Beaufort deposits are "potentially the largest reserves of phosphates in the world not presently being mined." According to Dr. Stuckey, they contain an estimated 10-billion tons in a 450-square-mile area.

The proposal was brought to the attention of the Mineral Resources Committee by Cherokee Securities Inc. of New York, which represents landholders in Beaufort County and leases 30,000 acres in the area. Cherokee proposed that the state spend the $60,000 and then make the results of the study available generally.

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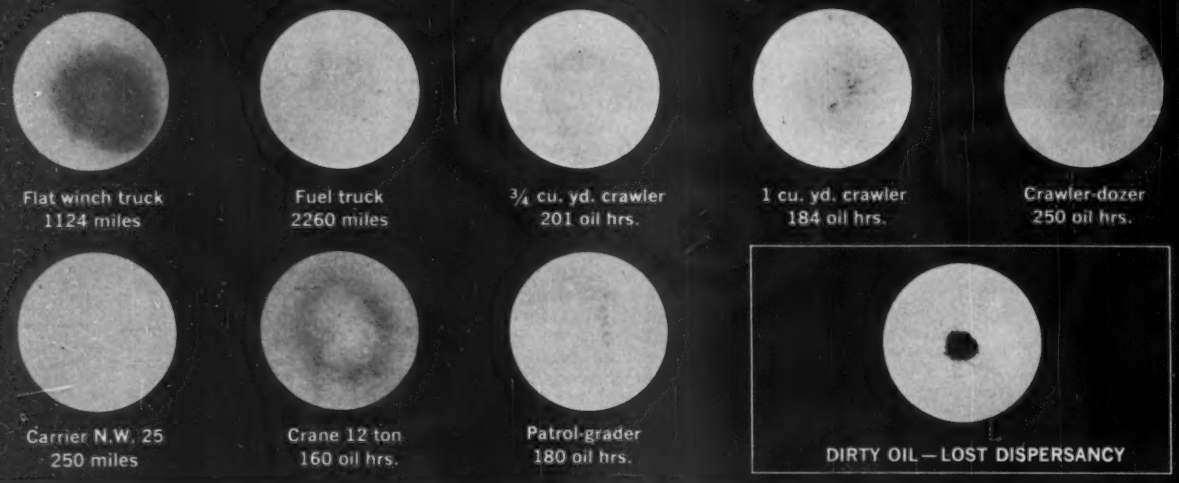

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A Michigan contractor* switched his entire fleet to Rotella® T Oil 20W/40—80 vehicles, 8 different types of equipment.

He now reports longer engine life due to reduced piston ring wear, reduced valve train problems and easier starting.

Read about his experience with Rotella T Oil 20W/40 and the Shell ADC® Oilprint Analysis.

"STICKING valves were causing premature engine failure," reports this contractor. "Then we tried Shell's Rotella T Oil 20W/40.

"Since then, valve train failures have been drastically reduced. Engines last longer.

"Starting is no problem now, even when the weather is well below freezing.

"Our entire fleet is now on Shell Rotella T Oil 20W/40. Cranes, bulldozers, pickups, cars—everything.

"Periodic checks with Shell's ADC® Oilprint Analysis show that we get improved oil performance with this Shell oil. And the Oilprints help us spot many troubles before they can become serious.

"For example, an internal coolant leak often will show up on an Oilprint before there are any other symptoms. What's even more important, Shell ADC Oilprints have helped establish the proper oil drain schedule for each engine."

Four key ways that Shell Rotella T 20W/40 can help cut costs

1 It can increase fuel mileage by reducing engine friction in cold weather.
2 It reduces motor oil inventory to a single, multi-purpose, all-season oil.
3 It can help reduce engine wear rates and extend overhaul intervals.
4 It lengthens battery life because engines start easier on cold mornings.

See your Shell Representative for full details about Rotella T Oil 20W/40 and the Shell ADC Oilprint Analysis. And ask him about Shell Rimula® Oil. It's recommended for all equipment requiring Series 3 oil.

SHELL

A Bulletin from Shell
—where 1997 scientists are working to provide better products for industry

*Name on request

through 1966, are producing approximately 10% of the uranium concentrates procured domestically by the United States Government.

United Nuclear is a substantial producer of nuclear fuels materials and nuclear reactor cores. Operating plants and laboratories in Connecticut, Missouri and New York, United Nuclear has manufactured and shipped approximately 30% of the total volume of naval reactor cores produced by commercial manufacturers. It has also furnished products and services for many atomic power plants in the United States as well as for installations abroad. United Nuclear was formed in May 1961 by combining the nuclear operations of Olin Mathieson Chemical Corp., Mallinckrodt Chemical Works and Nuclear Development Corp. of America.

Callahan Mining Enters Nonmetallic Minerals

ENTRY INTO KAOLIN, talc, limestone and other minerals by Callahan Mining Corp., formerly involved only in silver and uranium, has been announced by Joseph T. Hall of Callahan and Wright H. Huntley, president of Huntley Minerals, Inc.

This month, Callahan took over operation of the 16 Huntley operations, 13 in California and 3 in Nevada.

The properties, which will be mined by a new division, Callahan Industrial Minerals Co., with Mr. Huntley participating, contain kaolin, talc, limestone, siltex, garnet, silica, magnesium clay and pyrophillite.

Amax Boosts Output of Oxygen-Free Copper

AMERICAN Metal Climax, Inc. will invest $1,755,000 in the construction of new melting, casting and handling facilities to increase production of oxygen-free copper at the U.S. Metals Refining Company, Carteret, N.J., a subsidiary of Amax, Frank Coolbaugh, president, announced last month.

Consumer demand for OFHC brand copper has doubled since 1957 and the addition of the new facilities will provide a 100% increase in present production capacity to meet the increasing demand for this speciality copper by the electronic and allied industries, Coolbaugh said.

OFHC copper is produced by direct conversion of selected refinery cathodes under conditions which prevent contamination of the pure oxygen-free metal during the process.

A special gaseous atmosphere is employed to prevent air coming into contact with molten metal in a two-hearth furnace, in subsequent launders and on into the molds.

Resistance to hydrogen embrittlement, good ductility due to extreme purity, high electrical and thermal conductivity are the properties contributing to the constantly increasing demand by industry for the copper.

Interior Official Sees Wilderness Bill Changes

THE U.S. Department of Interior does not intend to use marketability as a sole test on validity of mining claims.

Assistant secretary John A. Carver—who is in charge of public lands—told E&MJ he also expects the House Interior Committee to amend wilderness legislation providing for mineral entry of reasonable type in wilderness areas.

At present, such entry is limited to prospectors with "hand tools" and there are other unrealistic restrictions.

Mr. Carver denounced as "foolish" the concept on marketability, asserted that the Courts of the land would decide this issue.

This quite definitely appeared to be a retreat from positions announced by officials of the Bureau of Land Management at the Seattle meeting of the American Mining Congress.

Mr. Carver took great pains, also, to assert that Congress was setting the policy and making the law on public lands issues. The Department of Interior is just administrating the law. He denied that there was any plan to usurp either Congress's rights or anticipate the courts through administrative decree promulgated by the Interior Department.

Mr. Carver said that basic to the Administration of the public lands was the Mining Law of 1872, with mineral entry at the heart of this law. He regards this law as vital and asserted the department would be guided by it. Mr. Carver said that he recognized it was quite possible to conduct lode mining and oil and gas operations in recreational or scenic areas without destroying scenery or knocking down rock formations. He said the department wasn't planning any amendment on wilderness, but added it was "realistic" to say the bill would be changed in the powerful Interior Committee of the House, headed by Wayne Aspinall (D. Colo.)

IN THE U.S.

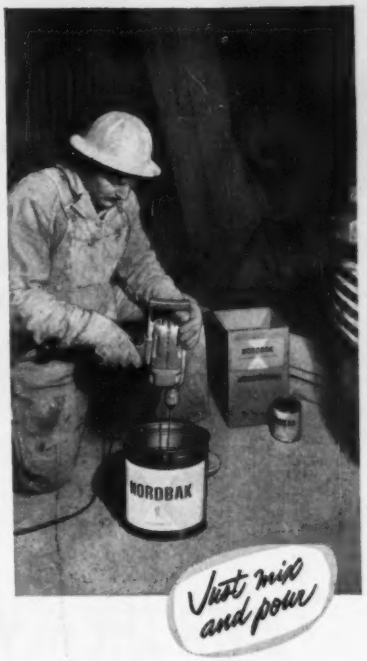
CALIFORNIA

Sonoma Quicksilver mine near Guerneville, went back into production in late September on a limited basis. The mine produced 94 flasks of quicksilver in the two-week period ending Oct. 7.

Mine has been leased to Glenn Truitt, Joseph W. Cook, and Graydon Weaver, who are operating it with 14 workers on a profit-sharing basis.

"Normal" production at Sonoma is about 300 flasks per month, and employment averages more than 60 people at that level.

A spokesman for the mine lessees told



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NORDBAK provides immediate, consistently effective support for manganese and protection for supporting structures throughout the life of the liners. Minimal shrinkage means that the manganese is completely backed with tough, resilient NORDBAK, thus affording impact-absorbing protection for supporting structures. These superior backing results are obtained much more simply than only fair results with metallic backing agents.

NORDBAK fills extremely narrow voids and is only ¼ the weight of other backing agents. You can buy it in "kits" of 10½, 21, or 52 pounds each. An initial low-cost order to back one set of crusher parts will prove the many advantages of NORDBAK.

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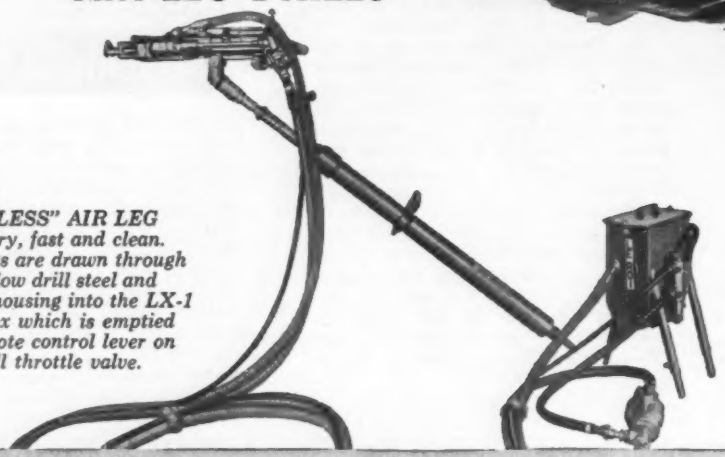
WITH THE NEW LE ROI DUSTLESS AIR LEG DRILLS



NEW "DUSTLESS" AIR LEG drills dry, fast and clean. Cuttings are drawn through the hollow drill steel and chuck housing into the LX-1 dust box which is emptied by remote control lever on the drill throttle valve.

Steels never stick when they're on the business end of the *new* Le Roi LLV Dust-Collecting Air Leg Drill. The dustless drill melts its way through the hardest rock — piles up more drilling footage with a lower dust count than was ever possible with wet drilling.

Dry, dustless drilling permits continuous ore sampling — saves every speck of precious ore. It eliminates the need and expense of water — does away with wet, dangerous conditions; sinking pillars; lost holes; water and muck haulage.

The LLV collects dust through the drill steel and exhausts it through the chuck housing — *not the machine!* It's ideal for mining or tunneling in hard rock — saves tools and operators.

Ask your Le Roi distributor for a demonstration. Or for more information, write to the Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

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AT-907

E&MJ that the market for quicksilver appears to be stiffening, and that although prices have not seemed to change, discounts are becoming less liberal.

Construction of the $1-million dryer at Coalinga Asbestos began late in September, with the remainder of the project started Oct. 5. Completion of all construction, including pilot runs, is set for mid-January 1962.

IDAHO

Idaho State Mining Inspector George Fletcher has ordered correction of practices in mines of the Coeur d' Alene district which have brought complaints from unions on grounds they were unsafe. He said the complaints generally concerned inadequate ventilation and the practice of permitting employes to work by themselves in underground areas.

J. C. Kieffer, manager of the Northwestern mining department of the American Smelting and Refining Co. takes issue with arguments that mine tailings in streams of North Idaho are the principal stream pollution problem in the area. Said Kieffer: "The pollution is of two types—sewage and mill tailings. As long as both are present, the sewage is the one which presents the hazard to health."

Completion of the No. 3 shaft of the company's Galena mine in North Idaho to the 1600-level is reported by Kieffer. The last 150 ft was sunk by following the pilot raise driven previously from the 1600 level with the firm's new raise climber, said Kieffer.

Two Kellogg mining firms, Caledonia Silver-Lead Mining Co. and Lookout Mountain Mining & Milling Co., have advised stockholders they have exercised options to purchase a group of 12 mining claims in the Keystone mining district of Montana, lying just east and adjoining holdings of the Nancy Lee, which the Bunker Hill Co. of Kellogg recently took over under an operating agreement.

Wonder Mining Co. of Golden has started driving a drift on the 220-ft level of the firm's old gold property three miles south of Golden. Lawrence Lemire & Son of Clarkston, Wash., have taken the contract for the tunnel work for the company, which owns eight claims near the historic Idaho townsite of Old Golden.

Bunker Hill Co. has hired 22 experienced miners from near Ishpeming, Mich., and hopes to recruit more underground workers from Michigan's Upper Peninsula.

A. B. Crouse, personnel supervisor for Bunker Hill said that many workers were out of work in the Upper Peninsula because of the shut-down of the iron mines.

Bunker Hill was hard hit by a 7½-month strike last year and some miners didn't return. Others left for underground work on missile sites. Others cannot pass the rigid physical examination.

MICHIGAN

Cleveland Cliffs Iron Co. is carrying on extensive research work in processing procedures designed to produce better concentrates from low grade iron ores, and to improve the methods employed, both as to efficiency and cost. At Ishpeming, Mich., the company has a staff of fifty employees in its research laboratory. At Taconite, Minn., the research lab has twelve metallurgists and lab technicians. Tests are still being conducted to improve the quality of the pellets produced at Cliffs' Republic and Humboldt open pit jasper mines in Michigan, already producing, and the Empire, which is scheduled for production in 1963. Five years of intensive research has gone into the perfection of their pellets. The research department is under the jurisdiction of Hugh J. Leach, vice-president in charge of iron ore development and foreign operations.

M. A. Hanna Mining Co. has announced the approval of a major expansion program for its Groveland open pit jasper mine near Iron Mountain on the Menominee range. The program is to be completed in 1963. W. A. Marting of Cleveland, who made the announcement, said that the new facilities to be installed would "produce the first partially fluxed ore pellets for sale in the U.S. ore market." The capacity of the plant will be increased from 700,000 tons per year to a pelletizing capacity of 1¼ million tons per year. The pellets will contain more than 60% iron. The expanded plant will raise the required work force from 180 to 250 by 1963 with a payroll increase of $500,000 a year. President Marting said that "the steel industry continues to demand increasingly higher grade ores for its blast furnaces."

The Sunday Lake Iron Co. underground iron mine at Wakefield, has been sold for an undisclosed price to four Gogebic Range area men.

Announcement of the sale was made by Pickands, Mather and Co., which operated the mine for Sunday Lake, a subsidiary of the Bethelem Steel Co., until the mine was closed last Feb. 16.

About 300 men were employed at the mine before it was closed because high labor costs and poor profits made it no longer economically feasible to operate. Most of the miners have been out of work since the closing. It was reported that the new owners planned to operate the mine on a profit sharing basis with the employees.

Named as members of the purchasing group were Emil J. Mascotti, an insurance agent; James Bria, a former Sunday Lake mine executive; and William F. Pellou, an attorney; all of Bessemer, Mich., and Roderick Tregembo, a Wakefield, Mich., mine executive.

MINNESOTA

Of the eight Lake Superior shipping ports for iron ore, all but one, Taconite Harbor, Minn., (Erie Mining Co.) had

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Now there's a
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A year ago two new Mack M Models—a 45-ton six wheeler and 30-ton four wheeler—made their debut to receive an immediate acceptance unprecedented in off-highway operations. Now four additional M's are ready to take their place alongside the trailblazing two—a 15, 18, and 25-ton four wheeler and a 30-ton six wheeler. This pacesetting line of heavy-duty rear dumpers and tractors introduces a new dimension in profitable and practical off-highway hauling.

What's so special about the Mack M Models? To mention but a few features, there's a completely new cab design . . . there are improved new high strength, light-weight, longer-lasting single floor bodies—with or without heated floors . . . there are new Mack axles and bogies . . . there are newly engineered, extra sturdy frames . . . there are power options up to 525 hp to provide the getup and go that meets any challenge.

Most special of all, they're Macks . . . finest products of a line that has worked its way to the front in heavy-duty off-highway service. Add the extra features of the new M Models to Mack's already firmly established reputation for getting the job done at lower operating cost and with minimum downtime, and you come up with the answer to true off-highway efficiency.

To select the right Mack for your own operations, contact your nearest branch or distributor. He's all set to show you what's so special about a Mack. Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario.

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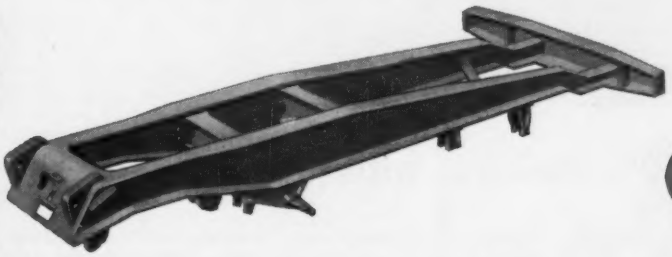
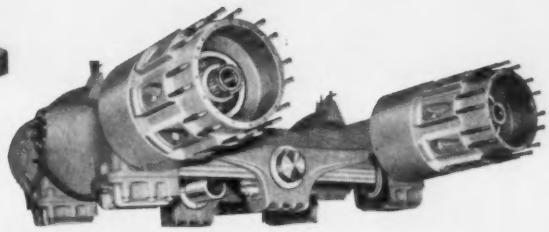
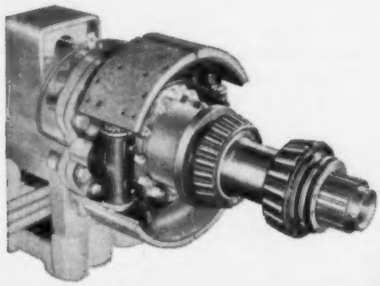


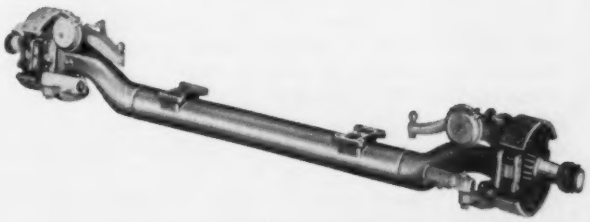
A NEW DIMENSION IN FRAME STRENGTH—Built to shrug off jarring shovel drops, the extra solid, extra strong five-crossmember frame of the M30X Mack is typical of the engineering advances in all M Models. Welded crossmembers, including integral front and rear bumpers, tie alloy steel fabricated I-beam main rails together.



A NEW DIMENSION IN BOGIE PERFORMANCE—Indicative of advances in all Mack M Models, this newly designed heavy-duty twin-axle bogie on six-wheeler M45SX offers the strength and simplicity of straight-through drive and single-reduction carriers with Mack Planidrive reduction at the hubs. Unusual bogie flexibility results in exceptionally long tire life, reduces frame twist and wracking and keeps all wheels equally loaded. Suspension is through walking beam and flat leaf springs.



A NEW DIMENSION IN BRAKING SURENESS—Safe, sure braking power for maximum control at all times is another feature of all M Model Macks. Illustrated here is the air hydraulic rear braking assembly for the M30X and M45SX. Front brakes are air; rear are air hydraulic with separate master cylinders for extra safety factor.



A NEW DIMENSION IN FRONT AXLE LOADING—The new tubular front axle, featuring steel tubing seven inches in diameter with walls ¾" thick, provides a reversed-elliot front axle for the M45SX and M30X that easily withstands the additional loading made possible by Mack's new forward cab location.

Truck bed liners made 50% cheaper with USS "T-1" Steel

"We couldn't cut down on the terrific abrasion caused by dumping thousands of tons of copper ore and waste, but we did cut our truck bed liner replacement costs. By switching to USS 'T-1' Steel, 321 minimum Brinell, we cut our material costs by more than 50%," say production officials of Miami Copper Company, Miami, Ariz.

"The use of USS 'T-1' Steel simplified and also speeded up our shop fabricating practices. Now, we simply burn off the bolts that hold a worn 'T-1' Steel truck liner in place, and bolt in a new liner.

"At present we're also using 1-inch-thick 'T-1' Steel plates as 'wear strips' in the shovel buckets and in the two chutes of our intermediate crusher. These wear strips add to the bucket's life, and the 'T-1' Steel chutes last considerably longer. In the pocket of the primary crusher we plan to replace the previously used steel with 'T-1' Steel."

USS "T-1" and the new "T-1" type A Constructional Alloy Steel both have a minimum yield strength of 100,000 psi or a minimum hardness of 321 Brinell, depending upon the application. Now USS "T-1" Steel is also available heat treated to 360 minimum Brinell. Both are tough, weldable steels with superior resistance to impact and abrasion. That's why these steels can lower your maintenance downtime. Find out how they can lower your operating costs, or reduce weight with no loss of strength. For more information, or to borrow our new 18-minute, 16mm movie, "How to Weld USS 'T-1' Steels," write to United States Steel Corporation, Room 6361, 525 William Penn Place, Pittsburgh 30, Pennsylvania. USS and "T-1" are registered trademarks.

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USS United States Steel

Minnesota *(Continued)*

lesser tonnages for 1961-up to Sept. 1 than for 1960's comparative date. Taconite Harbor had 4,423,672 tons in 1961 compared to 4,115,944—a gain of 307,728 tons.

In round figures Escanaba, Mich., has had 3-million tons in 1961 vs 4½-million in 1960; Marquette, Mich., 2½-million tons vs 3½-million; Ashland, Wis., 649,000 vs 737,500; Superior, Wis., 9½-million compared to 15-million; Duluth, Minn., 2.9-million vs 8.1-million; Two Harbors, Minn., 6-million to 10-million; Silver Bay, Minn., (Reserve Mining Co.) 3.3-million to 3.6-million and Taconite Harbor 4.4-million compared to 4.1-million.

Total U.S. Lake Superior ports, 31,956,063 tons in 1961 and 49,475,030 tons in 1960, a decrease of 17,518,916 tons. The decreases at the Duluth, Superior and Two Harbors docks account for about 80% of the entire loss.

It may be noted that the tonnage from the two ports which ship pellets only—Taconite Harbor and Silver Bay—have a combined amount of about the same as in 1960: a decrease of but 10,532 tons, an indication of steel plant preference for pellets.

Dr. James Neilson, professor of geological engineering and dean of the faculty at Michigan College of Mining & Technology, Houghton, was guest speaker at a nalumni meeting held in Hibbing Sept. 16. Dr. Neilson went to Michigan Tech in 1950. He had previously been associated with Canadian gold mining companies, the Quebec department of mines and had five years in the Corps of Royal Canadian Engineers, obtaining the rank of captain.

Carl B. Jacobs, vice president of Inland Steel Co., speaking at the American Mining Congress in Seattle, credited the prediction of Dr. E. W. Davis in 1943 to the War Production Board, that Minnesota's high grade reserves would be exhausted by 1954, and other similar predictions, for the sharply increased exploration programs in the U.S., Canada and South America. They also "gave a real impetus to the drive to find a way to make use of the billions of tons of low grade iron ores found in the Lake Superior district." He added that the huge cost of plants to beneficiate this low grade material had changed iron ore mining from "relatively small operations requiring modest investments to huge enterprises needing large sums of capital—which single steel companies could not provide from their resources."

He cited Armco Steel Co.'s reporting a 3000 tpd production, using iron pellets, from a furnace whose normal rating was less than 1500 tons a day. "Blast furnace men are clamoring for all the pellets they can get." He said that limitations on silica and other non-usable minerals "have already spelled the doom of some underground mining operation in the Lake Superior district—their costs are usually too high to leave room for further benefication expense." Now only 1½ tons of high grade pellets are needed

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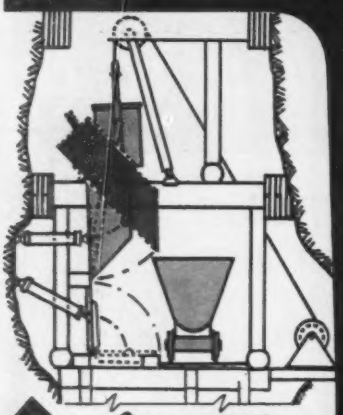

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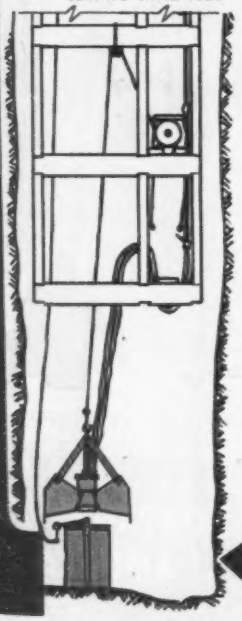

to make a ton of pig iron compared with two tons of direct shipping ore needed ten years ago. The future points to more demand for better ores; 34-million tons of high grade pellets and concentrates now are being produced in North America each year; 21-million tons more capacity is in research and development stage, and 17-million additional tons are being talked about.

He said the iron mining industry will continue to grow in the U.S.—"The best, cheapest product, closest to the market, will continue to be mined. Other less desirable properties will be laid aside until a future generation is motivated by forces comparable to those that provoked the present changes in our industry."

On Sept. 11 Pickands Mather & Co. resumed operations at the Babbitt Lake open pit mine, owned by the Youngstown Mines Corp. and located at Cuyuna Village on the Cuyuna range. Shipments will be of direct shipping ore and will employ about 70 men on a five day week, three shifts per day basis for the remainder of the season. The mine has an estimated 3,682,495 tons remaining. Its last shipment—136,895 tons—was in 1959. It was opened in 1952.

Reserve Mining Co.'s $120 million expansion program is progressing as planned, both at Babbitt and Silver Bay. It is expected to be ready in early 1963. About 2000 men are employed on the project. The No. 2 primary crushing plant at Babbitt, a duplicate of the original No. 1, is progressing on schedule. A second and parallel railroad track from Babbitt to Silver Bay is also under construction. 6000 cu yd of concrete have been poured in the crusher, drive house and bin construction. Foundations for repair shop additions at Babbitt are more than half finished and steel erection began in October. More than half of 24,000 ft of new 6-in. pipeline is in place. A rail yard and spur line to serve the new crusher plant required the removal of 500,000 cu yd of muskeg. Most of the 37,000 ft of rail necessary for part of the project is in place in the yard.

At Silver Bay, five big storage bins at the fine crushing plant have been completed, doubling the number of such bins. Two new pelletizing furnaces are being installed, larger than the original 6 ft furnaces. The pellet area will be increased from the present 2,750,000 tons capacity to 5-million tons by next spring. All phases of the work have progressed well, aided by favorable weather-both last winter and this summer.

The Zenith underground mine at Ely on the Vermilion range was closed for several days in September because of an unprecedented amount of heavy rains. The pumps were unable immediately to handle the additional water and working conditions could not be maintained. The Zenith is leased by the W. S. Moore Co. and the North Range Mining Co. and operated by the latter.

MONTANA

Multi-Mineral Products, Billings, has completed negotiations for the second of two major sulphur deposit leases.

The two leases are believed to give Multi-Mineral Products Corp. control of the major deposits of such mineral in the United States, according to E. O. Sowerwine, Jr., general manager of the company.

Analysis of the deposit runs as high as 70% of natural free sulphur and assures the company of adequate supplies of both sulphur and trace minerals for the planned expansion of Multi-Mineral Products operations in Montana.

The new leases, negotiated with Fred Gail of Cody includes 592 acres on deeded mineral deposits and a mineral claim.

The holding increases available sulphur deposits for the company by an estimated 50 million tons.

Processing of the mineral will be done at either the company's Red Lodge, Montana or Cody, Wyo., plants.

Mine shafts and other mining properties in the Butte area are being considered by the Defense Department for utilization for Civil defense purposes.

Senator Mike Mansfield had informed Mayor Vern Griffith of Butte that he had received a letter from Paul S. Visher, Department of Defense, which said that, "in the course of our shelter survey program we expect to survey mines to assess their capacities as fallout shelters.

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		H-W Super Castable
H-W Harchrome G		H-W Chrome Castable H-W Harchrome Castable H-W Lightweight Castable 26 H-W Extra Strength Castable LI
		H-W Standard Castable H-W Baffle Mix
		H-W Extra Strength Castable
		H-W Lightweight Castable Extra Strength
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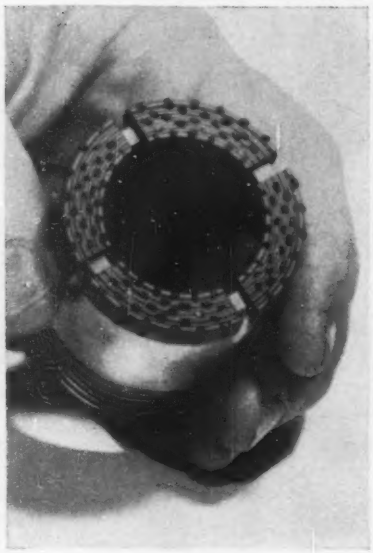

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Montana *(Continued)*

Cole Sullivan, county defense director, said that he considers Visher's letter as a signal to go ahead with plans already under study in Butte to use abandoned mine tunnels and other former mine sites for fallout shelter purposes.

Sullivan said that the Mammoth Mine near Whitehall is under consideration, along with the Alice Tunnel here, concrete foundations at the old Timber Butte Mill, and similar concrete and slag foundations at the old Pittsmount Shelter. He said that studies are also being made of the Tsarena Tunnel, the Minnie Jane, Bluebird, and Great Republic properties west of Butte and of mines in the Basin and Boulder areas.

Spokane National Mines, Inc., has rehabilitated the Hendricks Mine on the southern slope of Bannack and put a ten man crew to work about Oct. 15. Utilizing the cyanide flotation process 150 tons of ore daily will be processed with recovery of gold and silver the goal.

Current operations center around the Quien Sabe mine, which since last May has produced silver ore averaging around 250 oz per ton. A ten man crew was working the Quien Sabe, which is located 16 miles southwest of Dillon. Its ore is transported seven miles to the Hendricks mill at Bannock for processing.

Permission to prospect the Clark Fork River (Western Montana) for gold, using skindivers and a new water injection recovery method, was asked of the state on Oct. 11.

The request, which appears tangled in legal technicalities, was made to the Land Board by Walter T. Murphy, Mineral County attorney, on behalf of a client, Ed Freer.

Murphy said the prospecting equipment, mounted on a 30-ft diesel powered boat, began operation Sept. 24 but soon shut down when a water pump became defective.

However, he said, enough "color" was produced to convince the backers the operation could be a success.

Meanwhile, holders of a 20-acre mining lease in the area downstream from Superior brought suit against Freer, claiming ownership of the river-bed section he was working.

Murphy argued the riverbed is state property because the stream is navigable. He cited a 1916 opinion of the State Supreme Court which said it was common knowledge the Clark Fork of the Columbia River was a navigable stream.

That ruling, he noted, applied to an area 40 miles downstream from where the Freer dredge was operating.

Centennial Development Co. Eureka, Utah mine contracting firm is low bidder on a 1700 ft, incline ventilation shaft Anaconda Co. will drive at Never Sweat mine in Butte.

The amount of the bid was not disclosed. The new shaft will assist Anaconda in an appreciable increase in ore production from this property, mining men said.

Omer Edgar of Hall, was told on October 11 that if he gets a working agreement to put his state lease into phosphate production, he can have it for another 20 years.

The Land Board said that if this assurance is not forthcoming by October, 1965, when the present lease expires, the lease will be terminated.

Edgar and his lawyer, Harold L. McChensey, Granite County attorney, explained that interest in phosphate has recently quickened in Montana. They said a Canadian is interested in developing the property, but only if an extension of the lease is assured.

There has been no production from the lease issued in 1945.

"We are interested in seeing production, with a little royalty income," said Gov. Donald G. Nutter.

Modernization of cast house facilities at Anaconda Aluminum Co., Columbia Falls, for the production of larger sheet ingots was described by Ed Woster, assistant plant manager, in a talk at Missoula.

He commented that modernization was necessary to satisfy the demands of customers for larger ingots. The ingots are sent to AAC at Terre Haute where they are rolled into sheet and coiled and then sent to AAC at Louisville where they are turned into foil.

"The largest ingot produced at the Columbia Falls plant will weigh in excess of 8900 lb, be 13 in. thick, up to 40½ in wide, and the length will be 177 in. although greater length may be handled.

"Production of larger ingots necessitated the purchase of another crane of 10-ton capacity. The Traffic Department of the Anaconda Co., with the assistance of the Great Northern Railway officials, designed a versitile railroad flat car to handle the larger ingots. A shuttle service will be maintained between Columbia Falls and Terre Haute," Woster said.

Membership in the Southwestern Montana Mining Association, consisting of prospectors and small mine operators from Beaverhead, Jefferson, Madison and Silver Bow Counties, is growing. Nearly 100 persons attended the association's fall meeting and dinner in Twin Bridges.

Principal speaker was Stanley M. Lane, manager of the East Helena plant of the American Smelting and Refining Co. He gave an illustrated talk on the steps involved in smelting ore, from sampling to the production of bullion, and elaborated on the policy of AS&R relative to payment for zinc and lead, requirements of various ores for fluxing purposes, and the determination of treatment charges.

W. G. Maloney, Butte, secretary-manager of the Mining Association of Montana, outlined the high points of the lead-zinc bill recently signed into law by President Kennedy.

Plains may turn into a mining camp because lead in paying quantities are hoped to underlie claims leased by the newly formed Montana-Coeur d'Alene Mines, Inc.

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has leased these claims from the State Mining Co. The claims, located about 17 miles west of Plains on the south side of the Clark Fork River, were originally worked during the early part of the century by miners with primitive tools. The claims have all been incorporated in recent years by the late Fred Viles and leased by his widow to the Montana-Coeur d'Alene group.

Viles collected engineering and geologic data on the contents of the claims which has been also studied under the direction of Firmer Walkley, superintendent of mining operations.

Reports indicate that these veins may be extensions of the famous Couer d'Alene, Idaho, lode.

Located seven miles from the county road which serves residents in the Swamp Creek and Eddy Creek districts, the claims were frustrating to early day miners who worked them. Indications of the labor which went into the search was pointed out with the clearing recently of a 2400-ft tunnel singlejacked into the side of the mountain by Johnnie Burnham, still living in Plains, and the late Rags Wilkins.

The Beatty Drilling Co. of Metaline, Washington, is presently diamond drilling several shafts on the various claims for core samples. One hole of 500 ft has been finished and the rig moved to another location nearby.

Initial operations will cost some $30,000 with the corporation composed of several prominent Long Beach, Calif. physicians ready to expend $100,000 if the tests are promising. President of the group is Dr. Al Kauffman, a brain surgeon.

Articles of incorporation have been filed, and the Boulder Lake Corp., a Montana organization devoted to gold mining exploration, has been cleared by the Securities and Exchange Commission.

W. Dee Morris, attorney for the firm, said that the firm has been incorporated for one million dollars.

Robert T. Judd, Butte, is president, and director; David D. Walker, Butte, is vice president and director; Frank Garrison, Butte, is secretary-treasurer; Donald W. McGlashan, Butte, and Attoney Morris are the other directors.

The Boulder Lake property is located at the head of Dry Boulder Gulch on the west slope of the Tobacco Root Mountains in Madison County. The property is about eleven miles east of Silver Star.

It is planned to build roads, rehabilitate existing, and construct new surface buildings, to purchase machinery and other equipment at the operating site.

NEW JERSEY

Bemco Mining & Exploration Co., has shipped 2 to 50-ton ore shipments to Western uranium mills from the Company's property in Sussex County, during the past four years, according to Frank Warnett Sr., vice president. Shipments assayed 0.54 to 1% U_3O_8, more than 1% yttrium, and more than 6% rare earths. Shipments have been curtailed recently because of high freight rates. The owners are seeking financial support to build a concentrator.

NORTH CAROLINA

Foote Mineral Co. of Philadelphia, soon will begin installing additional large grinding facilities at its Kings Mountan, plant to supply increasing markets for spodumene-type stone and other mineral and metal products.

Neil O. Johnson, manager of the Kings Mountain operations, said the grinding mill will be moved to Kings Mountain from Cold River, N. H. He said it will process imported petalite ores and locally produced spodumene ores for use in the ceramic and porcelain industries.

Foote Mineral bought Solvay Process Co.'s operations at Kings Mountain in 1950, with production of lithium ore being its main purpose. A five-year contract signed in 1954 with the Atomic Energy Commission for supplies of lithium expired in 1959, but Foote continues to produce lithium at Kings Mountain along with its grinding of rock for various industrial purposes.

The company also is extending its operations there to include experimental processes for recovery of beryllium from the reserves of beryl ore; and other activities are directed at the recovery of mica, quartz and its products, and feldspar.

Declaring that continuation of the Federal Government's mica purchasing program is vital to the economy of Mitchell, Avery and Yancey Counties in North Carolina, as well as to the national security, Rep. Basil L. Whiyener (D-NC) on Sept. 21 introduced a bill in Congress which would provide for such continuation.

Whitener, who said he hopes the bill will be passed by Congress early next year. It would continue the government purchasing program until June 30, 1965, instead of allowing it to expire next year, as would be the case under existing legislation.

Rep. Whitener said the mica purchasing program has brought about $2-million a year into the three North Carolina counties for the past nine years, and reminded that mica is a vital component of electronic equipment and missile guidance and control systems.

TENNESSEE

American Zinc Company of Tennessee, subsidiary of American Zinc Lead and Smelting Co., closed down the Coy mine at Jefferson City, Sept. 15. The underground zinc mine had been operated on a development basis since February 1961.

American Zinc has two other mines operating in the East Tennessee zinc district, their Number Two mine at Mascot, and the highly mechanized Young mine near New Market. Both of these large underground mines yield only zinc.

Final annual figures for 1960, prepared

by the U. S. Bureau of Mines have just been released. They show that phosphate production in Tennessee increased to 1,939,000 tons which was valued at $15,424,000. This is an increase of more than 10% over 1959.

The report also states that Tennessee led the nation in the production of pyrite.

UTAH

Charles A. Steen will become executive vice president and a director of New Park Mining Co., Park City (Utah) district silver-lead-zinc-gold producer. The company's board has unanimously approved Steen's purchase of 200,000 shares of treasury stock at $1.50, and has given him six months option to acquire an additional 100,000 shares. The transaction is subject to approval of the Securities and Exchange Commission.

It has been reported that the Mi Vida uranium mine and the Uranium Reduction Co. mill at Moab (in which Steen was a major stockholder) have been sold for $26-million. According to the report, Steen, who discovered the property in 1952, will divide half of this between himself and his associates, with the remainder to be divided among 20,000 public shares of Ureco. stock, American Zinc, Lead and Smelting Co., and Hidden Splendor Mining Co.

Steen, a former Republican senator from Moab, is also a principal in the Topaz Beryllium Venture, owners of a substantial beryllium ore reserve at Spors-Topaz Mountain district, and president of Grand Deposit Mining Co., developing a silver lode at Alta district east of Salt Lake City.

Utah Construction and Mining Co. is planning major expansion. E. W. Littlefield, president, outlined the company's plans before the Utah Securities Dealers Assn. as follows:

The company plans to bring into production as soon as possible a substantial iron ore body amenable to open pit development at its Dayton deposit near Carson City, Nev. Littlefield said further that the company is now involved in negotiations which "if successful would increase U-C's profits substantially," and greatly increase the company's iron ore operations.

U-C is considering investing $10-million in a third phase of expansion at its Marcona Mining Co. iron ore operation in Peru. Marcona, controlled by Utah Construction, will complete a $22-million expansion this year, and in 1962 will have spent $20-million in installing pellitizing facilities. Expansion is expected to boost Marcona sales to 6-million tpy.

The company expects to start drilling in early 1962 on an iron-copper prospect northwest of Milford, Utah. If results are favorable, the firm will exercise acquisition option with Pinacle Exploration Co., controlled by Callahan Zinc.

Affiliated Pima Mining Co., currently mining and milling 3800 tpd copper ore in the Pima district of Arizona, will

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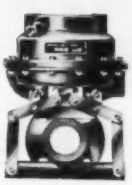
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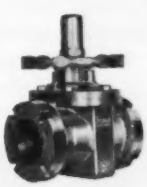
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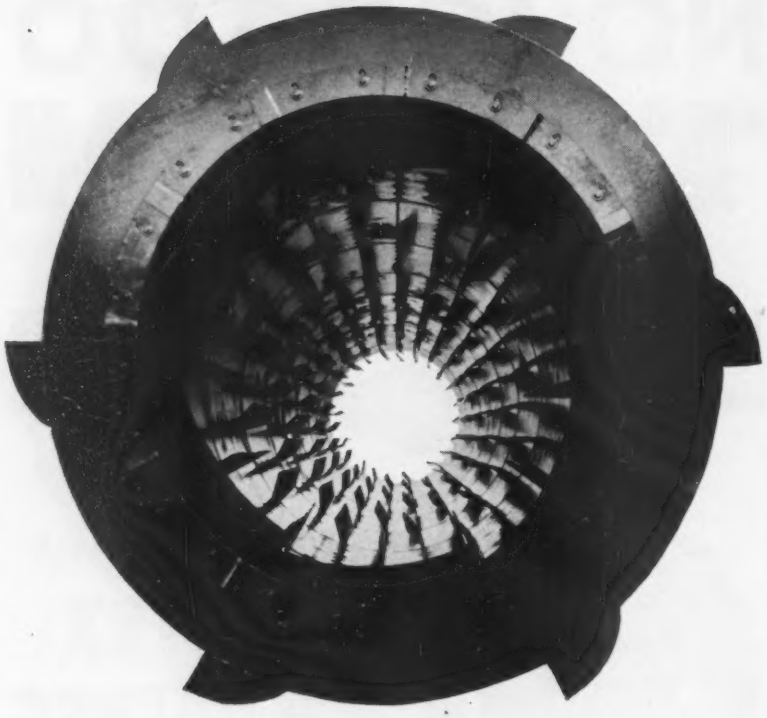

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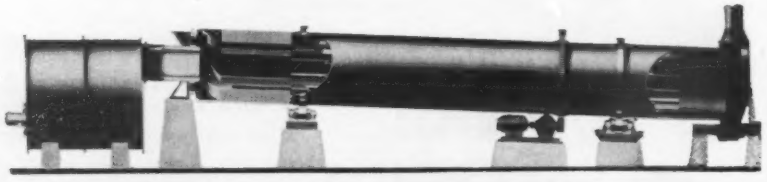

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double output as a result of U-C's decision to mine additional low-grade copper ore reserves in northeast sectors of the ore body.

Littlefield expressed optimism regarding the AEC's post-1966 domestic procurment plans, pointing out that many in the industry feel there will be a price increase as use of nuclear energy expands for power plant fuel after 1970.

WASHINGTON

The Northwest district office of the Atomic Energy Commission in Spokane will be closed sometime in November. AEC officials indicated that with the decrease of activity in raw materials in the Spokane area, the Salt Lake City branch will be able to handle the needs of the uranium mining industry in the region. The Spokane office was set up in 1955, when uranium mining operations were started in the Mt. Spokane district and on the Spokane Indian Reservation. The original four-man staff was reduced to two in 1958 and there has been only one employee at the office since June.

Pacific Northwest Alloys, Inc., Spokane, has reactivated a third arc furnace and called back about 40 workers at the firm's Spokane plant. The furnace had been shut down about a year ago because of a decline in steel industry demand for the firm's ferrochrome and other ferroalloy products.

Crystal City Mining Co.'s holdings in the Ft. Spokane area near Davenport, have been leased to Dolomite Products Co., Seattle. L. C. Williams, Spokane, president of Crystal City, said the Seattle firm plans 1500 ft of diamond drilling to block out the ore and another 1500 ft to explore a vein. The property was located in the 1890s for showings of lead-silver ore. It also contains an extensive deposit of dolomite.

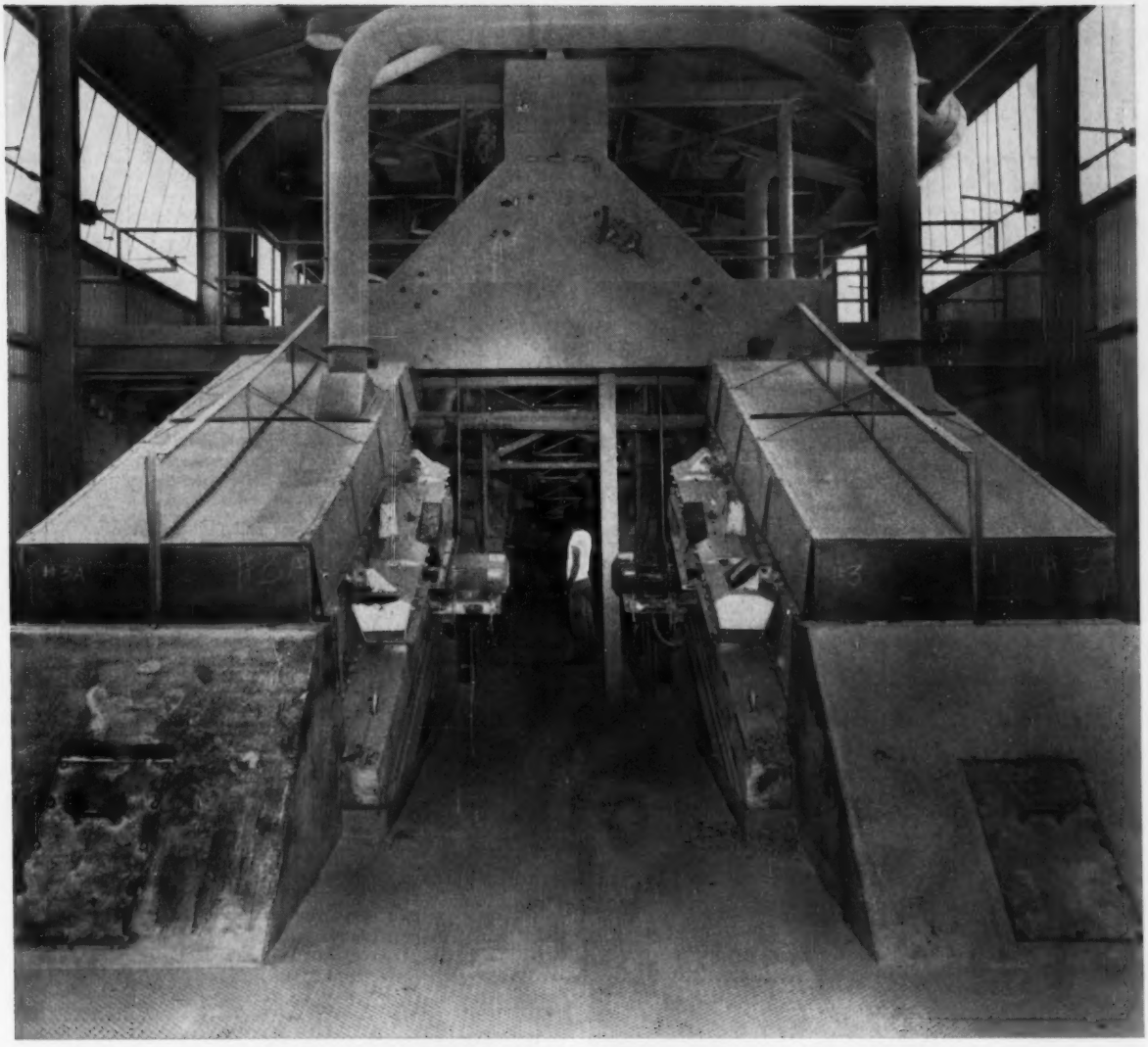
Daybreak Uranium, Inc., Spokane, has resumed ore shipments from the Dahl lease on Mount Spokane. The current shipment will involve only 260 tons of ore, but officials said exploratory drilling on new ground south of the firm's open pit mine will be started this fall.

WISCONSIN

Pickands, Mather & Co. announced in mid-October that it would reopen three Gogebic Range iron mines on a four-day week basis. The mines, employing about 700 men, were closed last spring.

The Geneva Mine at Bessemer, Mich., would operate three shifts, the company said, while the Peterson Mine, also at Bessemer, and the Cary Mine at Hurley, Wis., would operate two.

E. L. Joppa, of the mining firm's Lake Superior mining division, said the decision to reopen the mines was based on a move by the Michigan Tax Commission toward equalization of mine taxes, and an agreement with the union on a modification of the labor contract.



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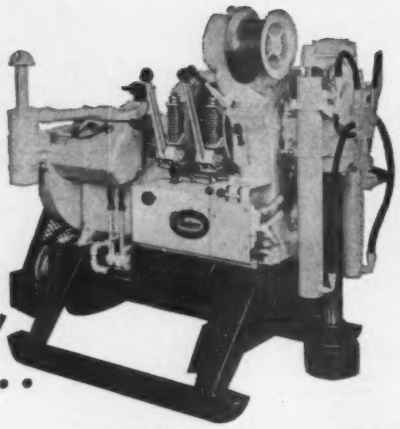

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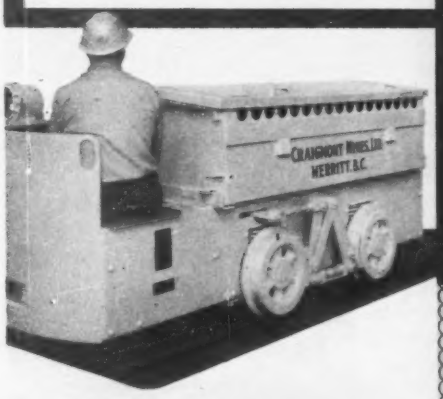

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IN CANADA

ALBERTA

A pilot plant operation for producing experimentally 100 lbs of "iron product" per day from iron ore deposits in Alberta's Peace River district will be conducted this winter by the Alberta Research Council in cooperation with Premier Steel, Edmonton.

Dr. N. H. Grace, Council Director, said that the test would be made in Edmonton at the Council's Research building "as a scaling up of lab studies on the process." He said that the total expenditure for the pilot project to produce 100 lbs daily of "iron product" would be $40,000, shared jointly by the Council and Premier Steel.

This will be part of an investigation by the Council into a new and experimental process which it has been working on. No details at all were released. When queried, Dr. Grace said: "There is a new process being investigated. The work on it was done here. We have nothing to say about it now . . ."

Premier Steel plans a multimillion dollar iron ore development program in the Worsley area of northern Alberta. This involves pipelining of the refined ore.

BRITISH COLUMBIA

Bethlehem Copper Corp. received the first $500,000 of a $5.5-million loan from the Sumitomo group in Japan, and is proceeding with its Highland Valley mine preparation and mill installation project according to plan. Production date will be approached next year.

The half-million dollar loan will cover work to April of next year when a further $1-million will be forthcoming. By October 1962 loans from Sumitomo will amount to $5-million and will be secured by a first mortgage debenture.

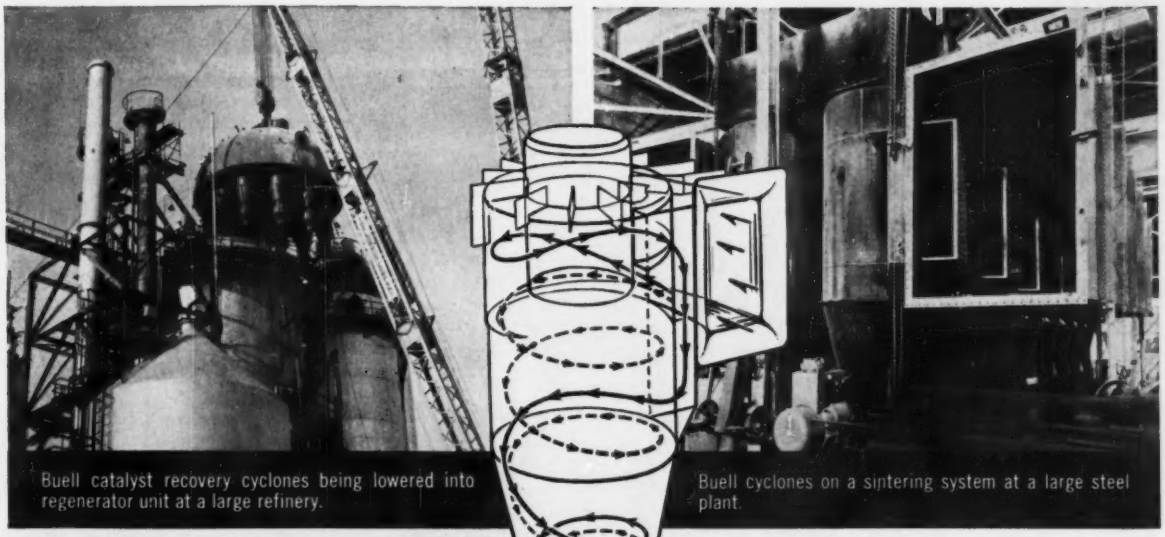
Equipment for the concentrator has been ordered and will be delivered next year. A contract is also being prepared for stripping 400,000 cu yd overburden from the East Jersey ore zone.

Craigmont Mines Ltd. officially opened its copper mine near Kamloops in September.

The property, scheduled to be one of Canada's major mines, is going into a production rate of at least 4000 tpd ore. Concentrates during the last two days of the break-in period assayed over 30% copper and recoveries were better than 95%. The new mine will add $18-million per year to the Canadian economy.

Two historic B.C. mines are returning to production. They are Golden Contact in the Bridge River area and Silbak Premier near Stewart. Mills of 100 tpd are being erected on both properties and production planned for early next year.

Huestis Mining Corp. Ltd. is arranging for exploration of a 23-claim property in the Kamloops copper camp. Presi-



Buell catalyst recovery cyclones being lowered into regenerator unit at a large refinery.

Buell cyclones on a sintering system at a large steel plant.

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Grosse Ile, Michigan

dent H. H. Huestis said the company has optioned the key claims.

Giant Mascot Mines has obtained an option to provide up to 50% of all future financing of Kamloops Copper Ltd. Giant obtained the option by buying 50,000 shares of Kamloops Copper at 12½¢. Work at the Kamloops Copper property, 10 miles west of Kamloops, includes de-watering of the old workings of the Norma shaft.

Galaxy Minerals Ltd. reports the first two zones of diamond drilling on the company's property show sufficient copper mineralization to warrant commercial operation. A third zone is being tested in the same part of the property.

An old B.C. silver mine has been re-opened by a Vancouver company, Vimy Explorations Ltd. Located between New Denver and Kaslo in the Slocan Mining Division, the Vimy property is the former Panama Silver Mine. Vimy Explorations state a road has now been completed from 2500 ft to 6500 ft elevation. No. 2 tunnel and workings have been re-opened and examined. An immediate start will be made to strip and trench the vein system for 2000 ft.

The Panama Mine is one of four former silver producers all adjoining and all owned by Vimy. They include the Silver Glance, the Empress, and the London Mines.

New Ainsworth Base Metals Ltd. has completed a deal with Base Metal Mines to operate the Cork Province Mill on a rental basis with ownership going to New Ainsworth within two years. New Ainsworth will also have rights to purchase the mining property which has a new shaft to the 8 level. The Cork Province ore reserves are about 100,000 tons.

NEW BRUNSWICK

Mount Pleasant Mines is continuing to obtain encouraging results in exploration of its tin and molybdenum deposits in Charlotte County. Two drills are currently being employed in a program which includes surface trenching, bulk sampling and geochemical work. Presently consideration is being given to the driving of a 1600-ft adit on the North tin zone. Latest drilling there has returned a 25-ft intersection averaging 0.7% tin plus values in zinc, copper and molybdenum. Additional intersections of higher grade were secured over narrower widths.

NEWFOUNDLAND

Atlantic Coast Copper is making steady progress in bringing mill rate up to capacity operations of 1000 tpd at its Little Bay copper mine. Originally, it had been anticipated that this rate would not be reached much before the end of the year or early 1962. July average was 827 tpd and August 975

Giant Foxboro Magnetic Flow Meter measures 11,000 gallons of rock slurry a minute

Exact metering of slurry velocity prevents pipeline breaks for Geo. M. Brewster

In three and a half months, Geo. M. Brewster & Son, Inc. filled a 65-acre swamp with more than 600,000 cubic yards of gravel — all piped in as slurry.

The rock slurry crackled through a 16" Foxboro Magnetic Flow Meter at 11,000 gpm. The big meter's job: keep tabs on velocity to prevent line breaks or line plugging.

Metering rock slurry is easy with the Foxboro Magnetic Flow Meter. That's because it has no flow restrictions — no orifice plates, no pressure taps—nothing to foul or plug up. Instead, two electrodes, flush-mounted in the tube wall, measure flow to an accuracy of ±1%.

The Foxboro Magnetic Flow Meter is a simple answer to the "impossible" problem of metering rock slurry.

It's likely to answer your tough flow measurement problems, too. So for more details, write for Bulletin 20-14. The Foxboro Company, 1911 Norfolk Street, Foxboro, Massachusetts.

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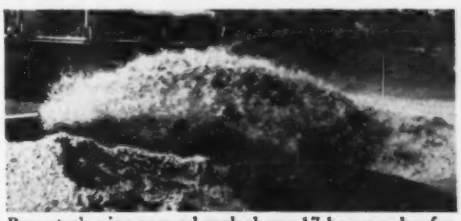
Foxboro Dynalog* Recorder receives flow meter signals — enables operator to regulate pumping rate.



Brewster's pipe spewed rock slurry 17 hours a day for 3½ months. Foxboro instruments needed no repairs.

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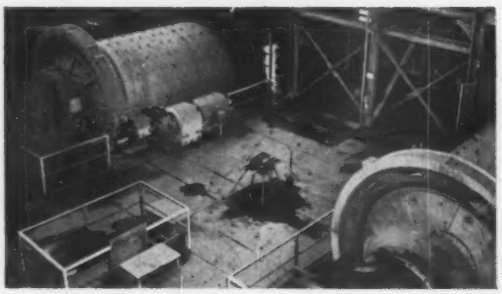
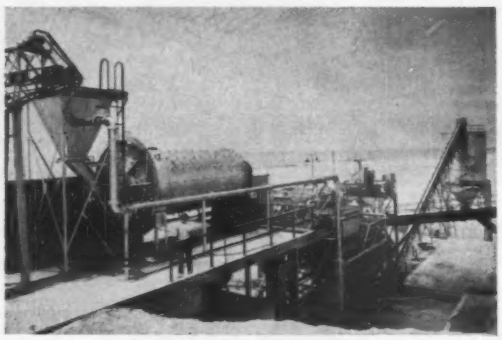


on iron

...two 9½' x 19½' Marcy Scrubbers successfully handle tough iron ore cleaning problem on Mesabi Range. This installation resulted from use of Marcy Scrubbers in two of the company's other concentrators.



on coquina shells

...7' x 16' Marcy Scrubber washes a minus 10" feed of coquina shells and pebbles for a large copper company in Peru.

Why you can cut costs with Marcy Scrubbers

- Marcy principle of small diameter, long length gives positive, active scrubbing, less short-circuiting, and low horsepower.
- Heavy duty construction, operation on trunnion bearings, and properly designed drives, combine to eliminate vibration.
- Trunnion bearing design eliminates maintenance problem due to corrosion and abrasion.
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tpd. First shipment of concentrates, amounting to 3600 short tons, has been made to the Gaspe smelter at Murdochville, Que. The mill started production at the end of April.

Consolidated Rambler has undertaken a drill program to test a strong anomaly, ¾ mile from the main orebody, at its copper-zinc-gold-silver property near Baie Verte. Sulphide mineralization, consisting of pyrite and chalcopyrite, has been indicated. On the main deposit, collaring of the shaft has been completed with sinking of a three-compartment shaft scheduled to start this November. Initial depth will be around 700 ft. Diamond drilling has indicated an estimated 650,000 tons grading 0.16 oz Au, 0.57 oz Ag, 0.8% Cu, and 1.54% Zn in the main deposit.

Flintkote Co. has started development work on its Flat Bay quarries where reserves of 45-million tons of gypsum have been proved. The holdings, leased from the Newfoundland government, cover nearly 3000 sq miles. The present program includes the construction of a 6-mile long aerial conveyor, pier facilities at Turf Point, crushing building and auxiliary installations at the quarries.

British Newfoundland Corp. Ltd. (Brinco) announced that a copper orebody at Whalesback Pond, warrants mining. Chairman H. Greville Smith, said that a decision whether to take the next step —further underground exploration to determine the extent and nature of the ore reserves—will be made shortly. Such further exploration would determine the scale and approach to any mining operation which might be undertaken, and would consume upwards of 12 months.

Work on the prospect is being done by Brinco's mineral exploration subsidiary, British Newfoundland Exploration Ltd., under a joint venture agreement with Anglo American Corp. of South Africa Ltd.

NOVA SCOTIA

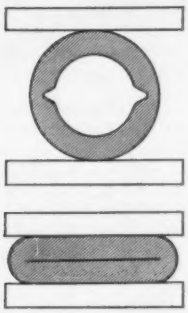
A full-scale exploration program is getting underway on extensive acreage along the Windsor-Horton contact near Walton, Nova Scotia. The exploration drive is being sponsored by Gunnar Mines-Lehman Bros. and a group of Toronto companies headed by E. F. Carr. The latter companies include Fatima Mining, Midrim Mining, Multi-Minerals, Talisman Mines and Sturdy Mines. The holdings comprise some 2100 claims. The program, which will see expenditures of some $125,000 in the next two years, is designed to seek possible repetition of the important silver-lead orebody discovered by Magnet Cove Barium Corp.

ONTARIO

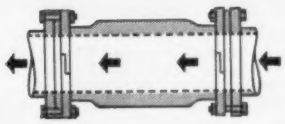
Deer Horn Mines, after a lapse of some seven months, has resumed milling operations at 80-85 tpd at its Cobalt-area

Massco-Grigsby PINCH VALVES

"Hinged" sleeve permits tight closing reduces wear.

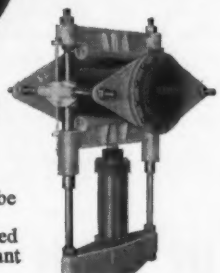


Recesses in sleeve serve as "hinges" during compression.



Unobstructed flow eliminates high friction loss; and there are no metal parts in contact with pulp or liquid.

Several types of closing mechanisms are available, from handwheel to motorized.



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silver property. About 5000 tons of broken ore is on hand in surface stockpile and underground workings. Grade runs around 24-40 oz per ton. A drive to investigate promising drill results is currently in progress on the bottom, or 800-ft level. This year a little more than two tons of hand-cobbed ore averaging 7000 oz Ag per ton has been shipped and more than a ton of high grade is on hand, ready for shipment.

Tinto Holdings Ltd. a wholly-owned subsidiary of the Rio Tinto Co. Ltd., has offered to purchase from present shareholders of Preston Mines Limited their common shares of Preston at the price of $7.20 (Canadian) per share.

Nickel Mining and Smelting Corp. has started shaft deepening at its Gordon Lake nickel property. The main No. 2 shaft is being taken down from 1290 ft to around 1800 ft. In addition, a road is being constructed to open an all-weather route to Lac du Bonnet from where concentrates will be railed to the International Nickel refinery at Sudbury.

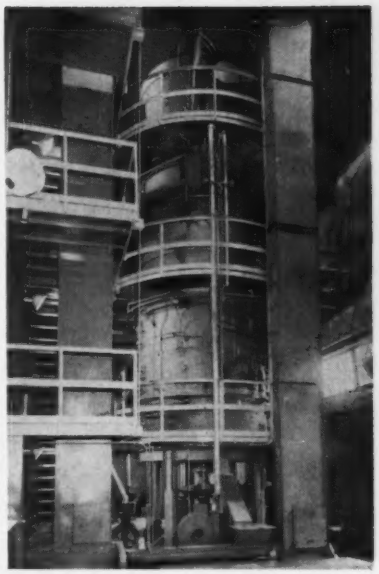
Hallnor Mines has picked up a new ore structure in diamond drilling on its gold producing property in the Porcupine area. Drilling has indicated some 140,000 tons averaging 0.76 oz gold uncut, 0.50 oz cut, between the 24 and 26 levels. Grade of present reserves is calculated at 0.35 oz. A new vertical winze is to be sunk for 1230 ft from the 21 level to depth of 4320 ft. Present bottom level is the 24. The new program will open four new levels to the 28.

McIntyre Porcupine Mines Ltd. has offered to buy Carium Mines Ltd.'s gold property for $50,000, subject to ratification of an agreement by Carium stockholders. Carium's mine, which was placed on a salvage basis in July 1960, adjoins that of McIntyre Porcupine.

McIntyre Mines' depth development at the big Porcupine gold producer is well ahead of schedule. The new No. 15 internal shaft has been extended below the new proposed bottom level at 7875 ft. The opening will make available an additional seven levels at intervals of 150 ft. Lateral development has been started already on the 6675-ft horizon with work planned to follow on the bottom, 6975 and 7125-ft levels. Ore from the new block will supplement that from the upper levels.

QUEBEC

Campbell Chibogamau is finding new ore at its Henderson mine in the Chibougamau area. While the findings are no surprise, the potential has been above expectations. One drill hole through a shear zone returned 64.5 ft averaging 2.97% Cu and 0.226 oz Au per ton and a second hole 100 ft to the north has cut 107.6 ft averaging 1.26% Cu and 0.146 oz Au with other holes returning values up to 29.5 ft averaging 3.69% Cu and 0.444 oz Au.



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A major base metal discovery has been made by the M. J. Boylen Group in the Ungava area. Preliminary sampling has returned good grade zinc, plus values in copper and lead and some gold and silver. The main find has been exposed for a length of 450 ft with widths ranging up to better than 100 ft. Another zone has been picked up 600 ft to the north, while showings of zinc have been located in four places in the southern section of the holding which comprises 159 claims. The area is located some 36 miles southwest of Fort Chimo at the junction of the Kaniapiskau and Larch Rivers.

McIntyre Porcupine Mines has uncovered five separate copper showings on its large holding in the Ungava district. The claims are located some 70 miles south of Fort Chimo at Wapanikskan Lake. No assays are available but grab samples are reported to have shown exceptionally heavy chalcopyrite. Further work is planned in the coming year as early as weather conditions permit. The find touched off a staking rush and it is estimated that some 2000 claims have been taken up during the past month or so. Others holding ground in the area are said to include Conwest Exploration, Dome Mines, the Keevil Mining Group, Hollinger interests and Northern Canada Mines.

Solbec Copper Mines is moving ahead toward production by the end of the year at its gold-silver-base metal prospect in the Aylmer Lake district, Eastern Townships. Underground development of the main ore structure is progressing well ahead of schedule, while construction of the 1000-tpd mill is nearing completion. On the basis of original surface diamond drilling, ore reserves are calculated at 1,380,000 tons above the 600-ft horizon, averaging 1.92% Cu, 3.8% Zn, 0.5% Pb, 0.014 oz Au and 1.05 oz Ag per ton. Solbec is wholly-owned by Hastings Mining and Development Co., a member of the Sullivan group of companies under direction of the Beauchemin interests of Montreal.

Prospectors Airways and associates have decided to go underground on their Joutel copper property, where over 1-million tons of ore has been indicated by diamond drilling. A 3-compartment shaft is to be put down to a depth of at least 1000 ft. In the meantime, diamond drilling is to be continued in a test of other geophysical anomalies. A new 5-million-share company, Joutel Copper Mines, is being formed to take over the property. Vendor interest will be shared by Prospectors Airways 37.5%, Kerr-Addison Gold Mines 35.7%, and Camp Bird Mines 25%.

A base metal mine, Cupra Mines, under the sponsorship of the Sullivan group, is slated to be brought into production in the Eastern Townships. It is anticipated that ore from the Cupra will be shipped for treatment to the nearby Solbec Copper mill. A 3-compartment shaft is to be sunk to an initial depth of 1600 ft, with sinking planned for early in the new year. A high grade lens has been indicated by diamond drilling with latest calculations showing 818,995 tons to vertical depth of 1200 ft having an average grade of 3.82% Cu, 3.53% Zn, 0.59% Pb, 0.023 oz Au and 1.36 oz Ag per ton.

Vauze Mines, adjoining Lake Dufault on the north, is starting tune-up operations at its 350-tpd mill. It will be the first new base metal producer in Quebec since 1948. Development and drilling has indicated some 144,000 tons grading 6% Cu, 4.7% Zn, 0.054 oz Au and 2.2 oz Ag per ton. The company is controlled by Consolidated Zinc Corp. of Canada, wholly-owned subsidiary of The Consolidated Zinc Corp., London, England. Waite Amulet Mines, Noranda Associates, holds a lesser interest.

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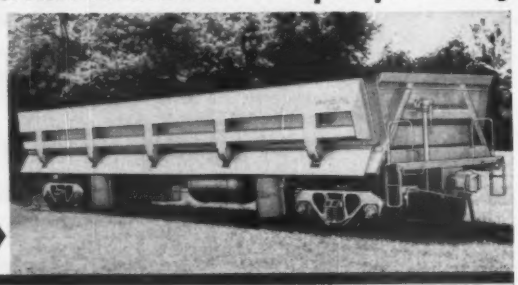
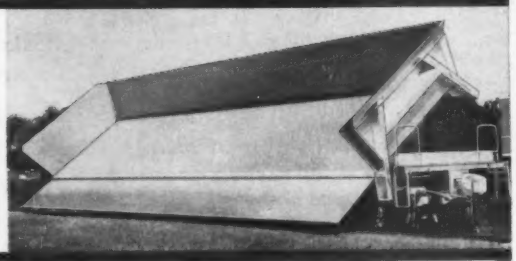
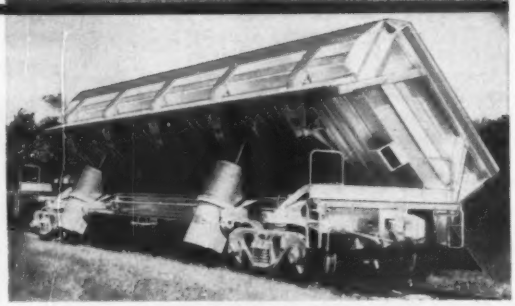


Smooth floor for clean dumping. Door and end construction designed to take the kind of beatings received in open pit mining.



Floor massively reinforced. Door operating mechanism under floor and protected from damage. Hardened and lubricated pins and bushings insure correct functioning and negligible wear.



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they will spend the next ten months setting up, operating, and training Brazilian drill men to run a drill at the Campanhia Vale do Rio Doce mine at Itabria. Vale do Rio Doce, Brazil's leading iron ore exporter, has a contract with Accesita S.A. steel mills under which it will develop two iron ore properties of the steel company, over a ten year period, which are estimated to contain about 25-million tons of 68% iron ore.

A titanium dioxide plant, large enough to meet Brazil's entire national requirements, will be built by Du Pont do Brasil S.A. The plant, whose site is yet to be determined, will use ores from newly explored ilmenite deposits. Final design and construction will be awarded to Brazilian engineering firms.

CHILE

Messrs. Horikoshi, Watanabe and Tsunkaiwa, who represent Mitsui Mining and Smelting Co. Ltd., announced that Mitsui has undertaken to buy the "Las Luces" copper deposit, 34 miles south of Taltal, Antofagasta province. Mitsui will start drilling the property at once under the supervision of Japanese engineers and, if results are satisfactory, will build a plant to treat the ore.

The Mantos de la Luna 200-tpd leaching plant, built by Compañía Administradora de Minas, S.A., is onstream. The plant, located 22 miles south of the nitrate port of Tocopilla, uses sea water for leaching since adequate fresh water is not available. Acid for leaching is obtained from the Corporación de Fomento 35-tpd acid plant (Lurgi design) built to supply the several small leaching plants located in Antofagasta province. Oxide copper from the Mantos de la Luna mine runs better than 4%.

IN AFRICA

South African gold mines produced a record 1,967,016 oz of gold in August, an increase of 32,791 oz over July. The value of the monthly gold output topped the $61-million mark for the first time.

The 130-million dollar expansion program begun by South Africa's Iron and Steel Corp. (Government controlled) in the mid 1950's to step up annual production to 2,350,000 ingot tons of steel will be nearly complete by the end of the year. The company has now launched a new expansion program costing an estimated $680-million scheduled for completion in 1973.

Big shipments of iron ore and manganese are being loaded at Port Elizabeth. Ships which sailed this month for Japan and the United States took large consignments. Iron ore shipments were three times heavier this August as compared with August last year.

The Minister of Economic Affairs, Dr.

ACKER DOUBLE-DUTY RIG
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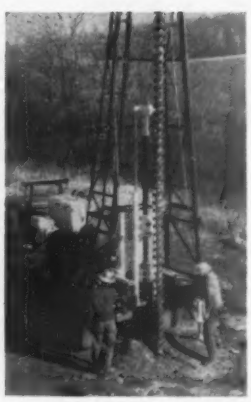

Acker SP handles 5 foot hollow-stem or conventional auger flights. Switches to roller rock, carbide, saw tooth or diamond bit coring. The SP handles angle or vertical holes, deep or shallow in any formation.

Core drilling or augering problems anyone? Just name it—the Acker SP will tame it! It's rugged and versatile . . . switches from core boring to augering. It has muscle to auger 300 feet or core to 1500!

Acker's SP is designed for heavy duty service. It has a four speed cathead hoist, built-in reverse and four speed transmission. It's completely self-contained and mounts on truck. Owners of the SP are reporting unprecedented results drilling and augering for soil samples, in hollow stem augering and geophysical and geological exploration.

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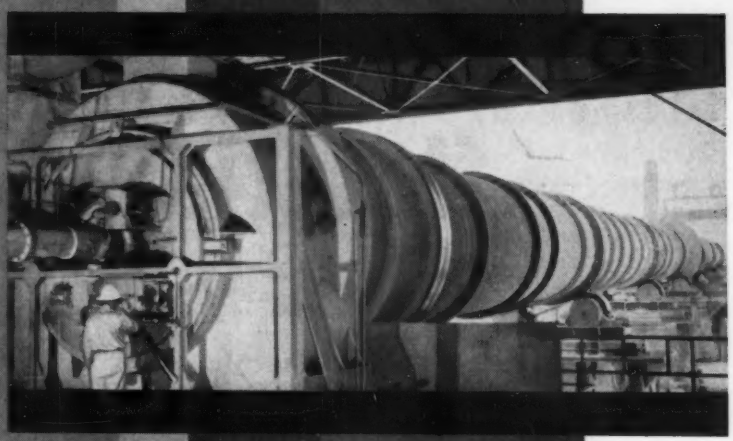

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TKA-15

N. Diederichs, has announced that about 20 mines on the Rand would probably have to close in the next four or five years with a consequent loss of gold of something like $62-million.

Despite widespread rumors of fabulous diamond discoveries in the British Protectorate of Basutoland within the South African borders, and hints of a new Kimberley, it now transpires that there has been nothing like this at all. In the past five years only two stones of real value have been found. Diamonds are being found but they are small. Diggers are at present working an area at Letsa-La-Draai 10,000 ft up in the Drakensberg Mountains near the source of the Orange River. This area was abandoned as unpayable by Jack Scott, the South African mining magnate who has the sole concession to seek diamonds in Basutoland.

Nine Japanese steel companies will participate in the development of the Ninba and Minado iron mines in Guinea. The participation of the nine companies, including the Yawata Iron and Steel Co., was requested by the Guinean Government and seven countries which will finance the project. The seven countries are Britain, France, West Germany, Italy, Switzerland, Belgium, and the Netherland.

The Overseas Steel Material Committee, formed by the nine companies, will send a delegation to a conference to be held in Paris in November to discuss establishment of a company to undertake the project.

Members of the Japanese delegation will include Yoshihiro Inayama, Yawata's vice president. The Japanese group is reported ready to invest about $1-million or 20% of the capital required.

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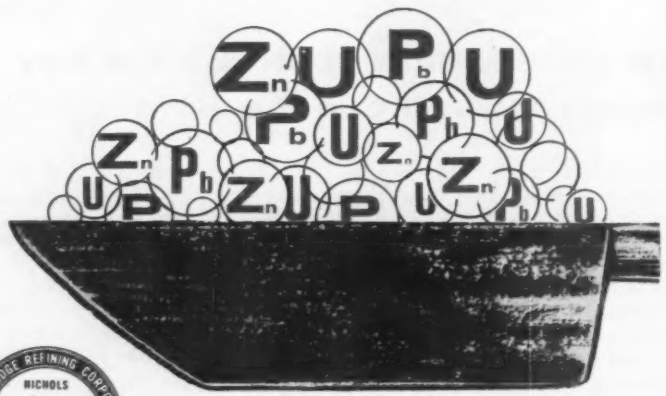

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IN EUROPE

CZECHOSLOVAKIA

Decreasing output of Czech uranium ore at the Abertamy shaft in Northern Bohemia was reported recently by AUFBAU UND FRIEDEN, German language periodical of trade unions in Czechoslovakia.

The periodical indicates that the rich deposits at the Abertamy shaft are depleted. Newly developed deposits, designed to sustain production, did not meet with expectations and the ore mining plan was not altered in time to these changing conditions. The final result was a considerable fluctuation in the output of uranium.

Experienced miners of Abertamy were sent to other mines, and new miners filled the ranks. This, too, further decreased output during the break-in period.

ITALY

During the first six months of 1961 Italy exported 3245 metric tons of aluminum pigs, against 4507 metric tons exported during the corresponding period of last year. Imports were also slightly down; these amounted to 18,402 metric tons during the first half of this year, against 19,167 metric tons in the first six months of 1960. During the first half of 1959 Italy imported only 8665 metric tons of aluminium.

The following was Italy's production of non-ferrous minerals and metals during July 1961:

	Metric Tons
Lead ore	6,436
Lead content	4,171
Zinc ore	
Zinc blende	15,188
Calamine	3,741
Ferruginous calamine	3,123
Zinc content	11,125
Metals	
Lead	4,365
Zinc	6,714
Silver	1,544 kg.
Cadmium	20,047 kg.
Antimonium ore	64,765 kg.

RUMANIA

Rumania's first aluminum plant is under construction near Slatina, Central Rumania, the CZECH TECHNICAL DIGEST reports.

Capacity in 1965, the end of the current Five-Year Plan, is to range between 20,000 and 30,000-tpy crude. Ultimate plant capacity is to reach 50,000 metric tons at an unspecified time.

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Western observers believe that Hungarian bauxite will be imported for final process, as Rumania possesses but small bauxite deposits. Rumania on the other hand generates enough electric power to engage in the costly (17,000 kwhper ton of aluminum) process. Hungary is more than short on electric power, is thus forced to export most of its locally mined and domestically processed alumina.

USSR

Analysis of coal and ferrous and non-ferrous ores are made in periods ranging from 5 to 15 minutes by use of chain reaction of alpha particles, gamma-quanten and neutron, according to a statement made by Igor Plaksin, corresponding member of USSR Academy to TASS.

The principle of the new method is the influence of a chain reaction within flotation products which result either in an induced radioactivity or creation of secondary core particles. Either of these two phenomena can be registered and thus facilitate easy analysis.

These chain reactions can also serve to register the content of various chemical elements within the flotation charge. TASS claims that Plaskin was able to achieve in the laboratory the continuous observation of "chemistry in the flotation charge."

Russia possesses all pre-conditions to produce ferrous metals in unlimited quantities, according to Wsewolod Boiko, Chairman, Department for Economics and Development of Ferrous Metals at the State Economic Council, in a statement to TASS.

Boiko says that Russian plans foresee annual production of 250-million metric tons by 1980—more than the current annual production of the non-Communist world.

Comparing efficiency in steel mills, TASS claims that Soviet average rests at 0.75 for blast furnaces (vs. 1.0 in U.S.) and an average yield of open-hearth steel per square meter of 7.7 metric tons (vs. 6.5 metric tons in U.S.).

Projected enterprises will work in a complete metallurgical cycle; new units in Siberia and Kazakhstan are currently under design along this principle.

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PHILIPPINES

Operations of Atlas Consolidated show steady improvement. A daily average of 11,522 tons was milled from the Lutopan pit in July, averaging 0.64 % Cu. During the same time, 1.4-million tons of waste were stripped. Copper production for the month was estimated at 4,389,700 lb, which established a new all-time monthly record for the mine.

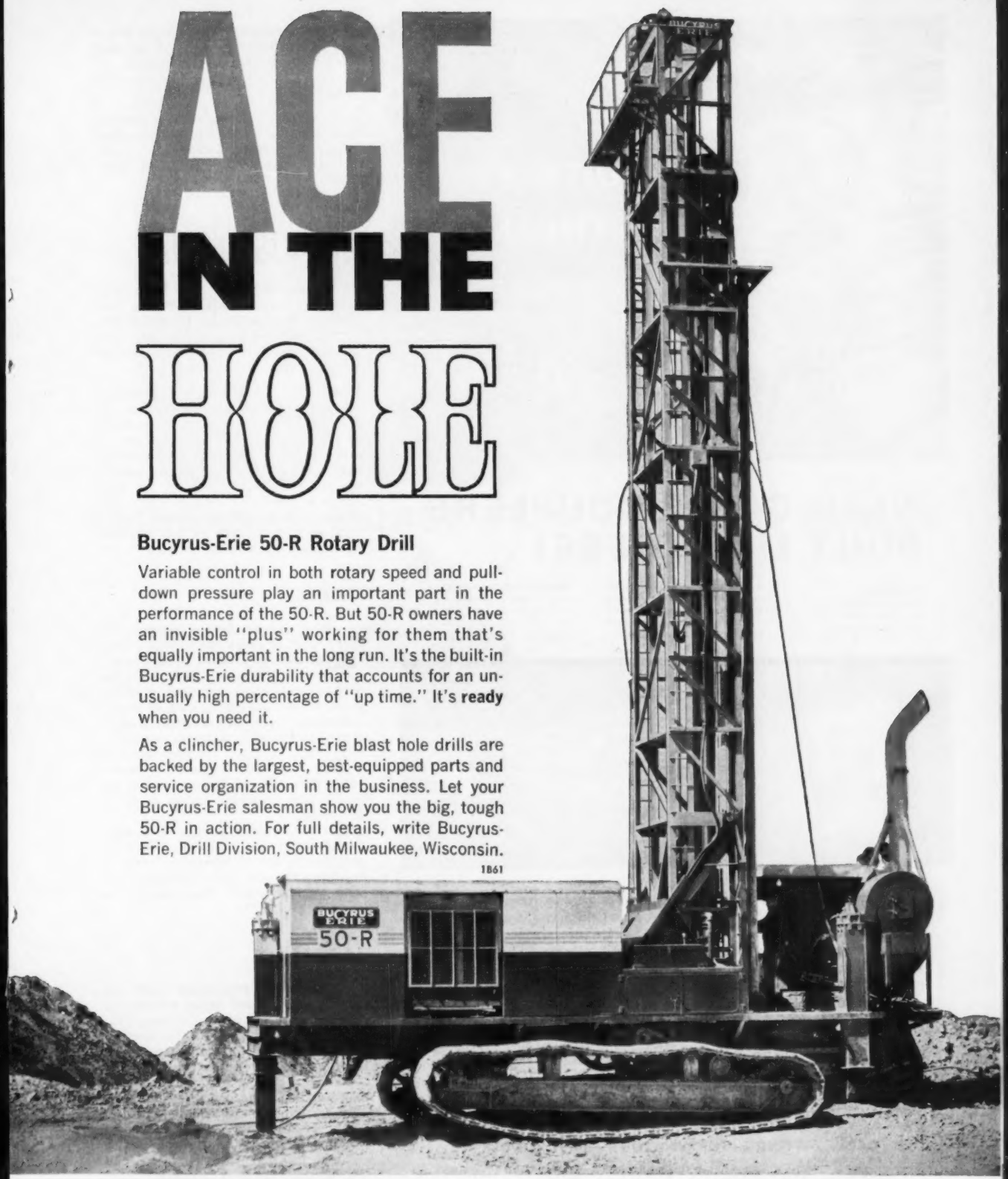
During the first six months of 1961 Benguet Consolidated, largest gold producer in the Philippines, produced 125,000 oz of gold from milling 620,000 tons of ore. This compares with 116,500 oz recovered from milling 611,000 tons in the same period of 1960. Ore reserves have been well maintained. In spite of the higher production, earnings declined because of the decline in the price of gold from 150 to 130 pesos an oz as a result of Government decontrol steps. To meet this drop in the price, the Philippine Congress enacted into law effective last June, to continue for three years, a Gold Subsidy Act which should return the price to 150 pesos. In addition to a new depletion allowance law, a so-called Basic Industries Tax Exemption bill was passed, under which gold mines may be exempted for payments of tariff duties on imports of machinery, space parts, and equipment for their operations.

Surigao Consolidated has announced that it has started hauling about 30 tpd of high grade copper ore averaging 10% from its new mine in Zamboango del Sur to its loading pier in Ozames City. Shipments will be made to Japan.

Lepanto Consolidated maintained its normal output in August, producing 2.6-million lb Cu and 4213 oz Au from milling 40,180 tons. Copper recovery was 96%, gold 78%. Average copper content of the ore milled was 3.37%.

Samar Mining Co. has an extensive ex-

ACE IN THE HOLE



Bucyrus-Erie 50-R Rotary Drill

Variable control in both rotary speed and pull-down pressure play an important part in the performance of the 50-R. But 50-R owners have an invisible "plus" working for them that's equally important in the long run. It's the built-in Bucyrus-Erie durability that accounts for an unusually high percentage of "up time." It's **ready** when you need it.

As a clincher, Bucyrus-Erie blast hole drills are backed by the largest, best-equipped parts and service organization in the business. Let your Bucyrus-Erie salesman show you the big, tough 50-R in action. For full details, write Bucyrus-Erie, Drill Division, South Milwaukee, Wisconsin.

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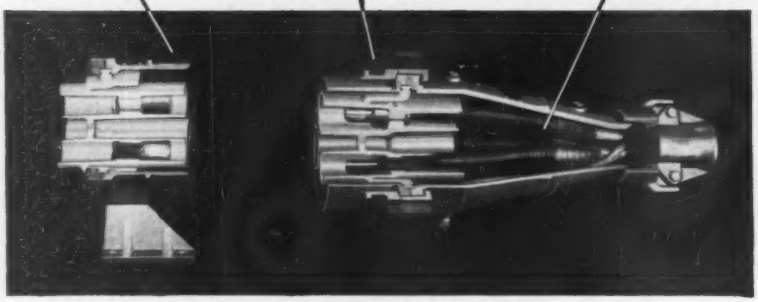

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ploration program going on in the Davao area of Mindanao, along the Malatigbao river. Several prospecting tunnels are being driven to test the outcrops at depth.

Pan Philippines Corp., a former pre-war gold producer, has a fairly well developed copper and barite property in Lobo, Batangas, which will soon be in operation.

IN AUSTRALIA

Two important iron ore fields have been disclosed at Tallering, Western Australia by Western Mining Corp. Ltd. The discoveries were made outside the Government iron ore leases and detailed work has been ordered.

Broken Hill South Ltd., an Australian mining operator, is preparing an announcement about large scale extension of the company's mining operations. It says that most important developments have taken place on the mining properties at Cobar, N.S.W. held by the company's subsidiary Cobar Mines Pty. Ltd. Broken Hill South Ltd.'s profit for the fiscal year ended June 30 was £A804,474 against £A986,508 last year.

INDIA

The West German firm of Koppers Export GmbH of Essen has secured a multimillion dollar contract from India's state-owned Hindustan Steel Ltd., for construction of an iron ore sintering plant, at Rourkela, in the state of Orissa.

Koppers, Essen, will erect the plant in collaboration with Koppers Company Inc., Pittsburgh, USA. The plant will have a capacity of 4000 tpd of blast furnace sinter. The value of the contract is approximately 40-million rupees or about $8-million.

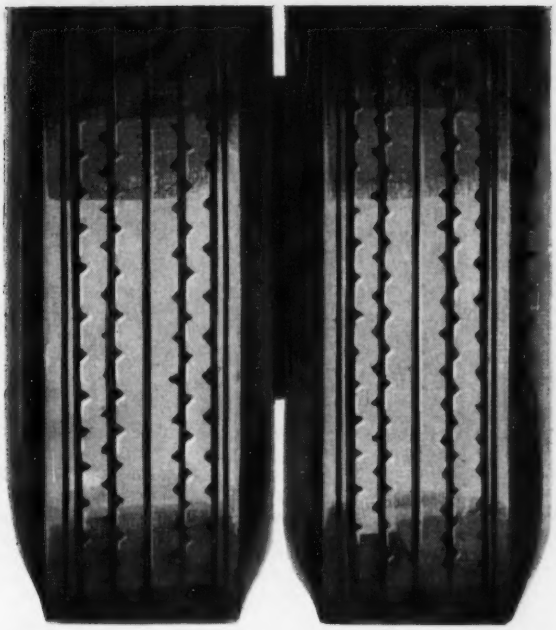
The new sintering plant is to be completed within two years. It will make possible the use of fine-grained ores in the West German built Rourkola steel plant—which would otherwise go to waste.

JAPAN

The Ministry of International Trade and Industry (MITI) said Japan will liberalize 90% of its trade by October 1962, subject to approval by a Cabinet meeting.

Scheduled to be liberalized soon are nickel ingot, part of zinc products, titanium and chrome products. Asbestos, tungsten ore, manganese ore, and mercury are expected to be put on tariff quotas by next April. The imports of various other nonferrous metal ingots, excluding copper, lead and zinc, and their products are to be liberalized mostly in October next year under the present liberalization program.

The nonferrous metal industry, which foresees considerably bad effects of the liberalization program, however, is ask-



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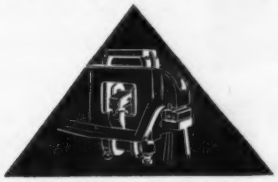

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ing the government to take a number of measures to protect it from such effects.

Such measures include the passing of some sort of mining industry standards law, the establishment of a tariff barrier and an organization for the purchase of unsold stockpiles as well as an increase in enterprise modernization loans.

Hidesaburo Kurushima, president of the Japan Mining Industry Federation, said Japan's nonferrous metal industry would be hard hit, if the imports of foreign non-ferrous metal goods are excessive. "In the event foreign products flooded the Japanese market," he said, "many inefficient nonferrous metal mines in this country would be forced to close down."

It is still open to question how many of the measures suggested by the industry will be adopted by the government but objections to such measures have been voiced by various industries using nonferrous metal products.

An industry obesrver said, "since there is a limit to measures that can be adopted to protect domestic industries, reorganization of the nonferrous metal industry is inevitable."

LETTERS

LIQUIDATION OF RIDDLE NICKEL PROJECT APPLAUDED

A while ago, in both the technical and public press, the settlement made by the General Services Administration in the liquidation of the Government investment in the Riddle (Oregon) Nickel Project came under considerable adverse comment. The dissatisfaction seemed to emanate from the General Accounting Office, which evidently felt that the final closing figure of $1,722,000 did not represent a fair return to the Government for a going concern, even discounting the value of the 50,000 tons of essential metal delivered to the national stockpile during the time of need. The question is, which party profited by the transaction?

It is true, of course, that the Riddle plant is currently in successful operation after six years' experience with the French Ugine method of straight electric furnace reduction of a very refractory silicate ore. But can the plant continue to function under peace-time conditions in competition with and without sufferance of the well established, low cost refiners of the Canadian sulphides?

Other groups in the past, for example, in North Carolina, New Caladonia, Brazil and the U.S.S.R. have failed to commercialize the oxide type deposits by similar direct electric furnace smelting of the raw ore to ferro-nickel. Before the spectacular rise in the market price of pure nickel from 35¢ to 80¢ per lb, it was considered that a furnace feed of not less than 3½% nickel tenor was necessary to permit competition with the copper-nickel sulphide refiners. In fact, the writer, in a search before the war for a suitable process for handling

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WRITE FOR BULLETIN 760

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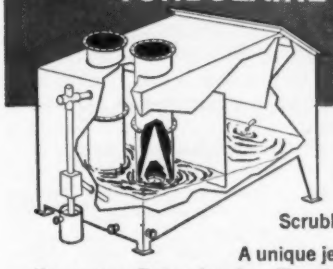

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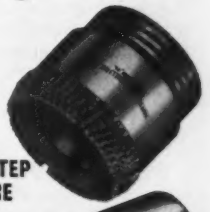

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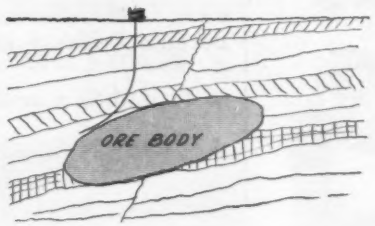
ARE DEFLECTING DRILL HOLES
BY-PASSING ADDITIONAL RESERVES?

A mining company in the Eastern United States started a drilling program looking for new reserves. Several thousand feet of drilling developed no new reserves.



PROBLEM:

Were the drill holes "bottoming" where they were planned? There was a strong belief that the holes were "Off-Course".

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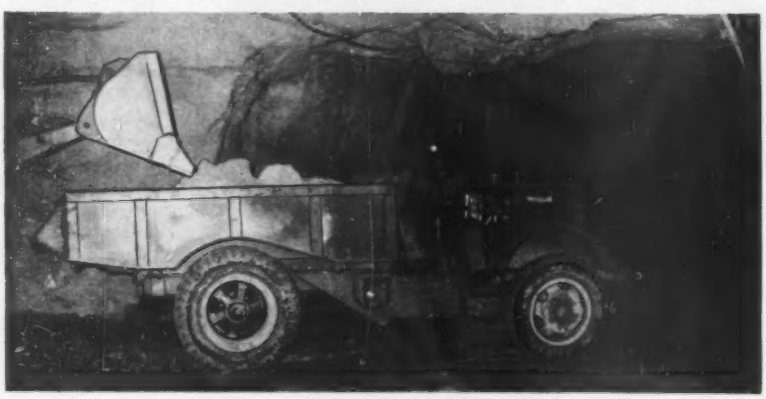

SCOOT-CRETE CD-4, shown being loaded in mine, will carry up to 15 tons payload. Model CD-3N has 5-ton payload. Note driver's side-mounted position for maximum vision and efficiency, forward and rear.

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the huge garnieritic ore bodies of the Celebes, discarded the idea of both electric furnace reduction and ammon-carbonate leaching in favor of an acid lixivation technique which provided a dependable high nickel extraction with cyclic return of the solvent acid. Whether even such an economical acid extraction process could compete especially with the newest methods evolved by Inco engineers, contemplating the recovery not only of their conventional metals but also of practically all of the sulphur and the iron of their ferruginous ore in the form of readily marketable products, is problematical.

The Hanna Nickel Smelting Co., while having achieved a commendable success at Riddle, must now work in a normal market under the handicap of a low grade raw material (under 1½% Ni), and with reserves reportedly close to exhaustion. The alternative necessity of maintaining production with raw materials imported from far-off Indonesia, interior Brazil or the Philippines, with all its expense and uncertainties, is manifestly something to be concerned about.

For these and other reasons, it appears to the writer that the GSA authorities should have been commended rather than reproved for the settlement they negotiated in the liquidation of what they likely considered an expendable nickel plant.

G. W. Pawel
Metallurgical Engineer
Norris, Tennessee

FOR FOOT READ YARD

In the article "Chemical Treatment of Earthen Floor Reduces Thickener Water Seepage" (E&MJ, September, p 103) the cost per square yard of wetted area using the SS-13 treatment was incorrectly listed as the cost per foot.

The Editors

PORTABLE PENSION PLAN

I take this opportunity to answer your call for supporting letters on the issue of an industry-wide portable pension plan. It goes without saying that I am all for it. It seems to me that the mining man, more than any other professional or semi-professional man, has the least opportunity of building a fund through his most productive years in view of the frequency with which he moves from position to position, from company to company, and from location to location. In this process, any monetary accumulation between moves is dissipated on the move. He, therefore, has to depend on Social Security and whatever pension plan may become available to him.

I realize that a portable pension plan might be quite cumbersome in view of the great number of companies that could be involved. For this reason, I should like to suggest something that would be quite simple, while at the same time quite as effective. I am referring

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to annuities. I am not an expert on insurance. I know, however, that one can buy annuities by the month or by the year, individually or in a group. Thus, a man may work for a company for a certain number of years, and when he leaves that company he may have accumulated an amount of pension (after his 65th birthday) which he will have with him wherever he goes. By moving from company to company, this stock of annuities (paid in part by the employee and in part by the employer) can accumulate to a sizeable amount by the man's retirement.

Mining Engineer
Grants, N.M.

AID TO EDUCATION

I find that our library has not more than a dozen or so copies of ENGINEERING AND MINING JOURNAL, and I do not see how you can teach Economic Geology without having a file. Do you have back-volumes for say the past ten years or more which are available? We are presently in a position to pick up back numbers if they are not too terribly costly.

Forbes Robertson
Head, Dept. of Geology
Principia College of Liberal Arts
Elsah, Illinois

Editor's note: We know that our readers sometimes have considerable files of back issues of E&MJ which they would be more than willing to sell or donate to interested parties. If you are among them, we are sure Mr. Robertson would appreciate hearing from you.

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1—18" Kue Ken Gyratory

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1—20 NN2C I-R 2 drum, 20 HP.
1—BF212 Sullivan, 2 drum, 20 HP.
13—A5NNOH I-R, 2 drum, air.
1—20 ML4D I-R, 2 drum, 20 HP.
1—AF-211 Sullivan, 2 drum, 10 HP.
3—15 NM2F I-R, 2 drum, 15 HP.
1—15 NN1F I-R, 2 drum, 15 HP.
3—20 NM2C I-R, 2 drum, 20 HP.
7—30 NN3D I-R, 2 drum, 30 HP.
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1—BF-312 Sullivan, 3 drum, 20 HP.
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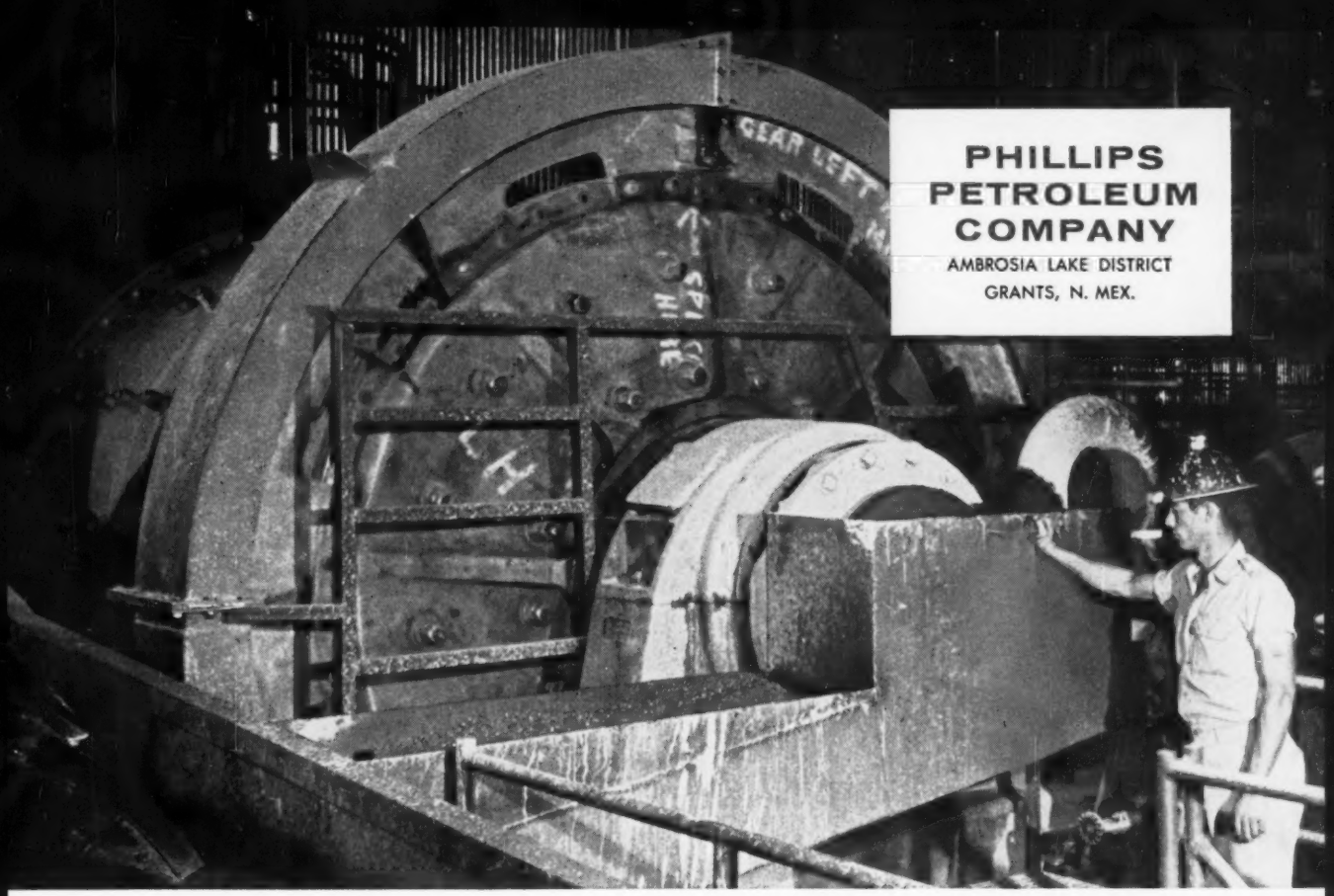

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